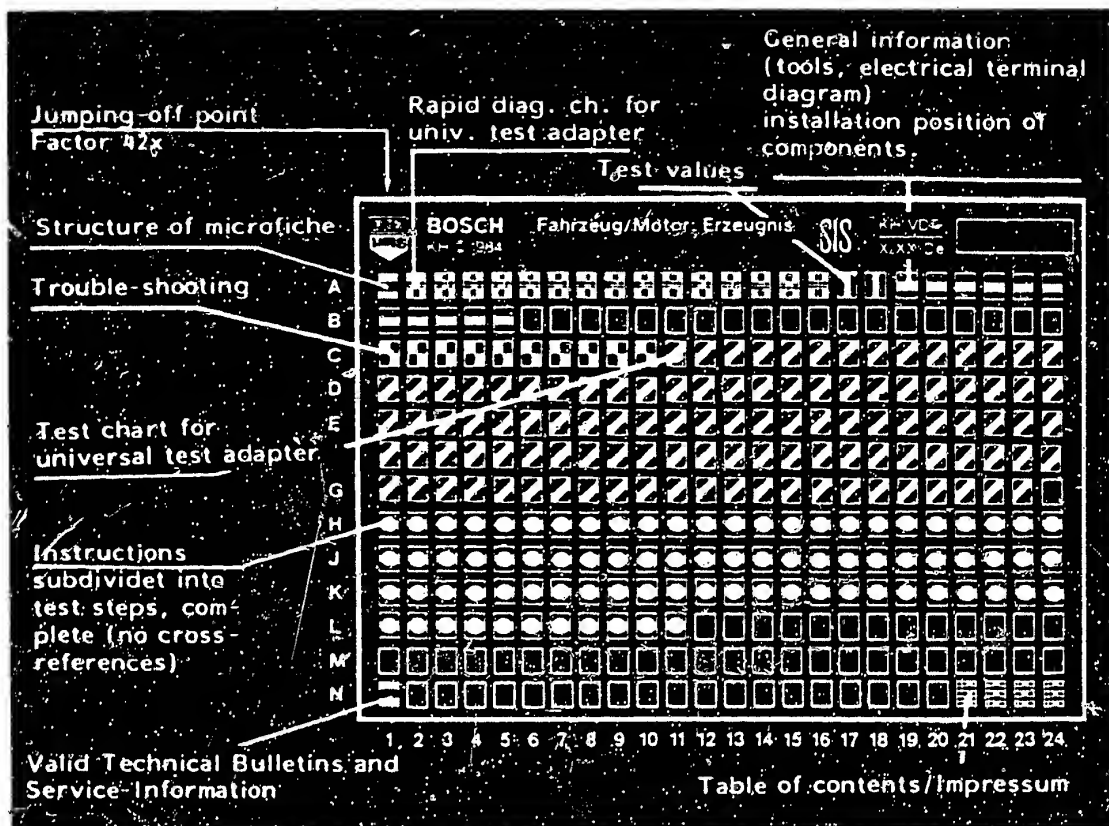


Structure of microfiche

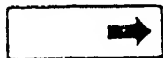


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

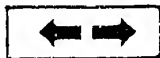
E16	Product, component, test step
	Vehicle, engine

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1

Trouble-shooting program



SPECIAL FEATURES

This microfiche card contains the testing and repair instructions for the Motronic in the

- Porsche 911 Carrera with a 3.2 l/6-Cylinder engine (9.83)

The models for Sweden/Switzerland/Australia and the USA/ Japan are also covered.

1. RAPID DIAGNOSTIC CHART FOR THE UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic expert to quickly check the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Readings on the multimeter and motortester
- References to coordinates of the relevant detailed testing and trouble-shooting program.












If detailed information and instructions are necessary, always proceed according to the trouble-shooting program starting on Coordinate C 1.

A2

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		Notes	Test specifications (reading)	For trouble-shooting, see coordinates
	V	Ω			
1		1	Shift into neutral. Ignition off. Disconnect control unit and pump fuse No. 16. Measure insulation resistance of rotational speed sensor Term. 8 to Term. 5	<u>greater than 1 MΩ</u>	C 18
2		2	Measure insulation resistance of the reference mark sensor Term. 25 to Term. 5.	<u>greater than 1 MΩ</u>	C 20
3		3	Measure winding resistance of the rotational speed sensor Term. 8 to Term. 27.	<u>0.6 ... 1.6 kΩ</u>	C 22
4		4	Measure winding resistance of the reference mark sensor Term. 25 to Term. 26.	<u>0.6 ... 1.6 kΩ</u>	D 3
5		5	Measure resistance of the temperature sensor, engine (NTC II) Term.13 to Term. 5.	at 15° to 30° C: <u>1.45...3.3 kΩ</u> (dependent on temperature)	D 7
6		6	Measure resistance of the temperature sensor, air (NTC I) Term. 22 to Term. 5.	at 15° to 30° C: <u>1.45...3.3 kΩ</u> (dependent on temperature)	D 9
7		7	For California and Japan models only: measure line resistance Term. 10 to Term. 5.	<u>less than 10Ω</u>	D 11
8		8	Not used	-----	-----
9		9	Accelerator pedal at rest. Measure resistance of the idle contact Term. 2 to Term. 5	<u>less than 10Ω</u>	D 13
10		10	Step down on accelerator pedal. Measure resistance of the full-load contact Term. 3 to Term. 5.	<u>less than 10Ω</u>	D 17
11		11	Measure resistance. Ground Term. 16 to Term. 5.	<u>less than 10Ω</u>	D 19

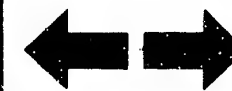
A3

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



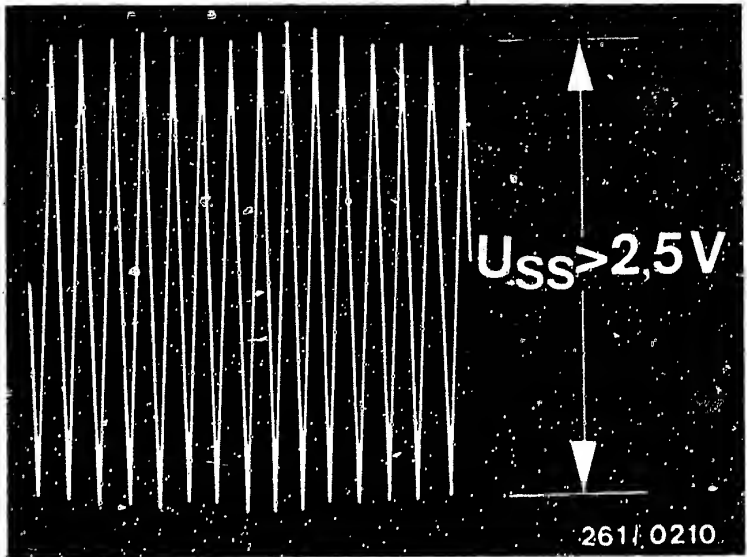
A4

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



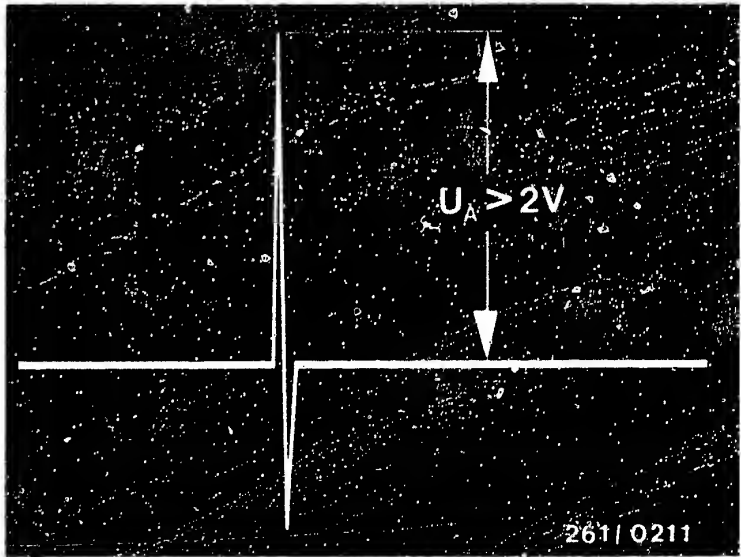
Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		Notes	Test specifications (reading)	For troubleshooting, see coordinates
	V	Ω			
12	↓	12	Measure resistance. Ground Term. 17 to Term. 5	less than 10 Ω	D 21
13	↓	13	Measure resistance. Ground Term. 19 to Term. 5	less than 10 Ω	D 23
14	↓	14	not used	-----	-----
15	↓	15	Measure resistance of the altitude sensor (switch), Term. 28 to Term. 5. Switch closed (over 1000 m elevation) Switch open (less than 1000 m elevation)	less than 10 Ω $\infty \Omega$	E 1
16	1	15	Measure signal with oscilloscope. Rotational speed sensor Term. 8 to Term. 27. Shift into neutral and start.	see figure at top	E 3
17	2	15	Measure signal with oscilloscope on reference mark sensor Term. 25 to Term. 26. Shift into neutral and start.	see figure at bottom	E 7



Rotational speed sensor signal

Reference mark sensor signal



A5

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



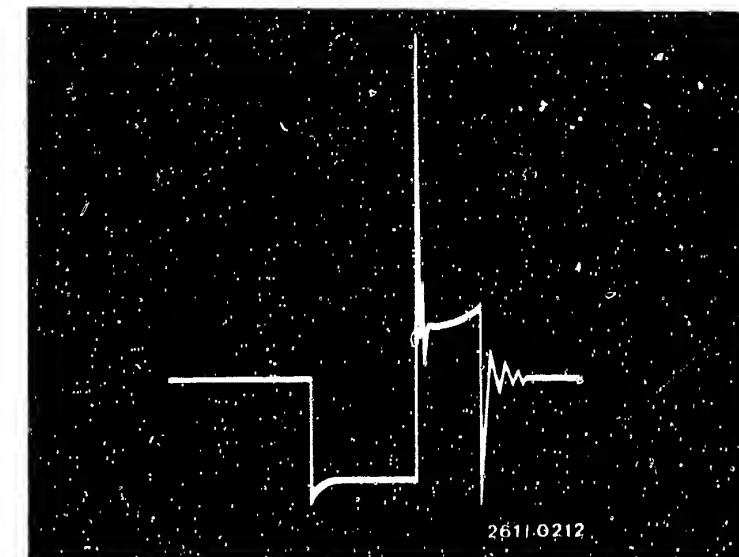
A6

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



Rapid diagnostic chart for universal test adapter (continued)

Test step	Switch setting		Notes	Test specifications (reading)	For troubleshooting, see coordinates
	V	Ω			
18	3	15	not used		-----
19	4	15	Measure voltage on air conditioner Term. 29 to Term. 5. Switch air conditioner on.	greater than 8 V	E 12
20	6	15	Measure voltage on main relay Term. 35 to Term. 5.	10 ... 15 V	E 14
21	7	15	Measure voltage on main relay Term. 18 to Term. 5.	10 ... 15 V	E 16
22	5	15	Ignition off. Connect control unit. Ignition on. Measure ignition signal with oscilloscope. Shift into neutral and start. Control unit, ignition output stage Term. 1 to Term. 5. Evaluation: signal present.	see figure	E 18



Ignition signal

A7

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



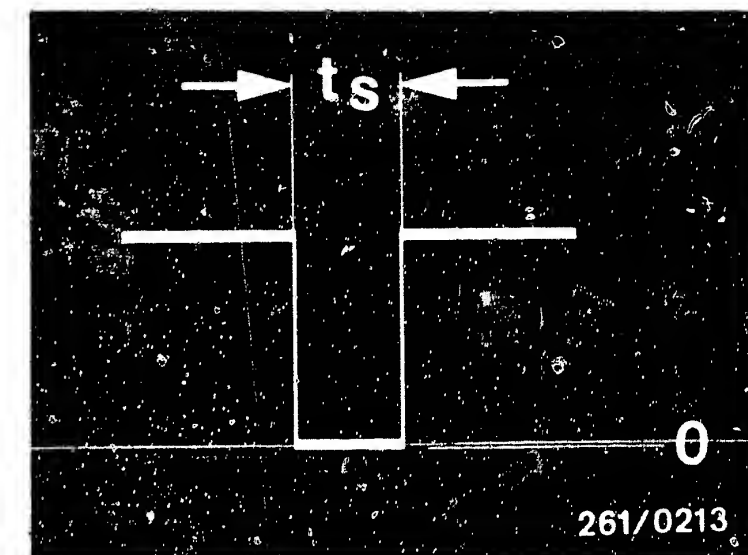
A8

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



Rapid diagnostic chart for universal test adapter (continued)

Test step	Switch setting		But-ton	Notes	Test specific-ations (reading)	For trouble-shooting, see coordin-ates
	V	Ω				
23	8	15		Measure voltage on control unit Term. 9 to Term. 5	approx. 5 V	E 20
24	9	15		Measure voltage on air-flow sensor Term. 7 to Term. 5. Air-flow sensor flap at rest:	220...280 mV	E 22
				Air-flow sensor flap opened:	greater than 4.5 V	
25/ 26	10/ 11	15		not used	-----	-----
27	12	15		Measure voltage. Starting signal Term. 50. Term. 4 to Term. 5.	8 ... 15 V	F 1
28	13	15		Check dwell period signal t_s from the control unit using oscilloscope Term. 21 to Term. 5 Shift into neutral and start.	see figure	F 3



t_s = Dwell period signal

A9

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



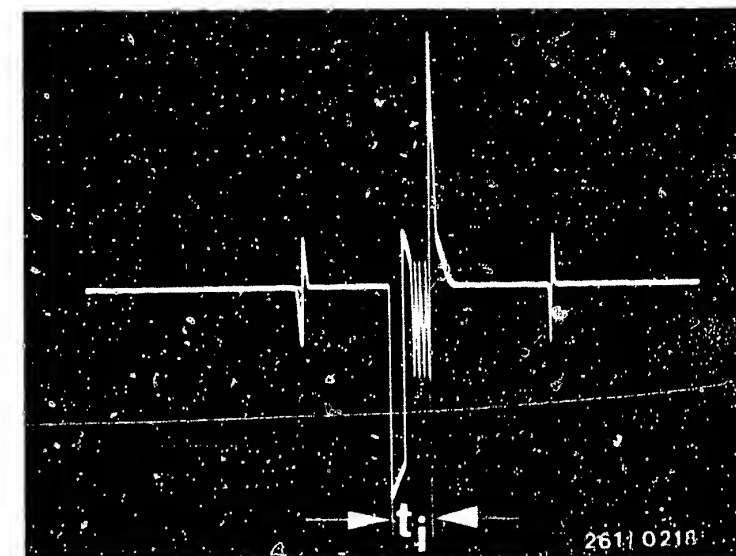
A10

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera

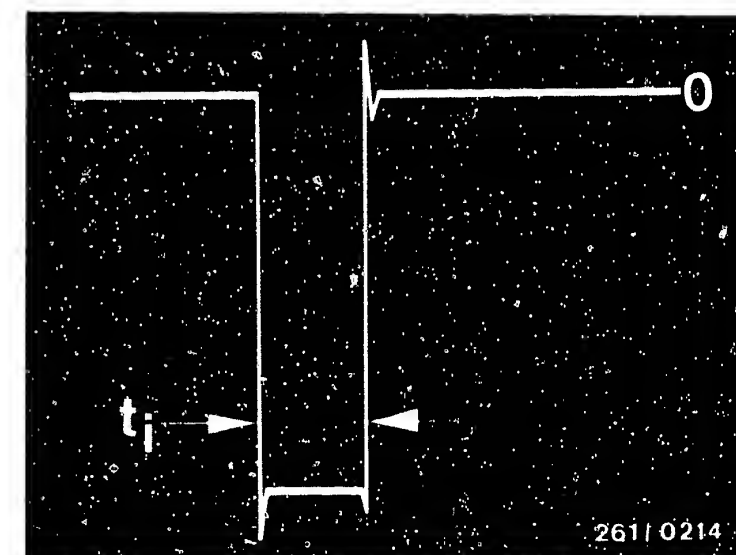


Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		But-ton	Notes	Test speci-fications (reading)	For trouble-shooting, see coordinates
	V	Ω				
29	14	15		Check fuel-injection signal t_i from the control unit using oscilloscope Term. 14 to Term. 5. Shift into neutral and start.	see figure at top	F 5
30	14	15	T 1	Like 29, but fuel-injection time becomes somewhat longer after button is pressed (NTC II, cold)		F 8
31	15	15		Like test step 29, but check Term. 15 to Term. 5.		F 10
32	16	15		Measure fuel-injection signal t_i from the control unit using oscilloscope Term. 11 to Term. 5. Shift into neutral and start.	see figure at bottom	F 13



t_i = Fuel-injection signal



A11

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



A12

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		But-ton	Notes	Test specifications (reading)	For trouble-shooting, see coordinates
	V	Ω				
33	17	15		Measure voltage on control unit Term. 20 to Term. 5. Plug in pump fuse. Switch on ignition (the pump relay coil is being tested).	10 ... 15 V	F 15
34	17	15		Measure voltage on control unit Term. 20 to Term. 5 (the pump fuse in the control unit is being tested). Measure voltage. Shift into neutral and start.	max. 4 V	F 17
35	17	15	T 3	Ignition off. Connect pressure gauge. Plug in pump relay. Ignition "ON". Press button T 3, read fuel pressure.	2.3 ... 2.7 bar	F 19
36	17	15		Connect motortester. Connect CO-Tester. Run engine. Check idle speed and CO. To adjust idle speed, put the idle speed control out of commission as follows: At test socket, connect Term. B and C. Switch off all load devices. Intake air temperature 15° ... 35° C. Measure before catalytic converter, disconnect lambda sensor.	750 ... 850 min ⁻¹ 1.0 ... 1.5 vol. % CO SW/SWITZ/AUS: 0.5 ... 1.0 vol. % CO USA/Japan: 0.6 ... 1.0 vol. % CO	G 1
	17	15	T 2	As above, values unchanged!		
37	17	15		Run engine. Check timing advance angle at idle. Important! Idle speed must be between 750 and 850 min ⁻¹ or other timing advance angles will be indicated! Test possible only using diagnosis cable (1 684 463 095).	- 6° ... 0° SW/SWITZ/AUS, USA/JAPAN: -10° ... -4°	G 5
	17	15		Check timing advance angle at full load. Set rotational speed at 3800 min ⁻¹ and press button T 6 (full-load button).	22° ... 28° at rotational speed 3800 min ⁻¹ SW/SWITZ/AUS: 23° ... 29°	G 5
38	17	15		Dwell angle at idle	8° ... 20°	
				Dwell angle at 3000 min ⁻¹	25° ... 42°	

A13

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



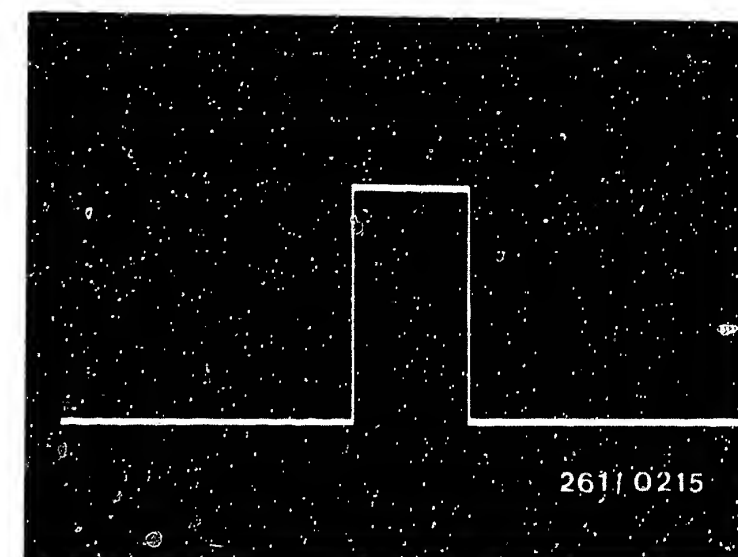
A14

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		But-ton	Notes	Test specific-ations (reading)	For trouble-shooting, see coordin-ates
	V	Q				
39	17	15	T5	Keep rotational speed constant at 3000 min ⁻¹ . Press button T 5. Fuel-injection signals stop and re-turn at approx. 1100 min ⁻¹ .	Engine "hunts"	G 9
40	18	15		Check on/off ratio of the idle speed control Term. 33 to Term. 5.	Signal present	G 11
41	19	15		Check on/off ratio of the idle speed control Term. 34 to Term. 5.	(see figure)	G 14
42	20	22		Only USA/Japan: Measure CO. Lambda control "rich" stop. Term. 24 from control unit to ground.	CO rises to approx. 4...5 %. After approx. 10 s, the CO value drops again.	G 17
43	20	23		Measure CO. Lambda control "lean" stop. Term. 24 from control unit to + 2 V.	CO drops below 0.6 %. Engine runs rough.	G 19
44	20	24		Measure CO. Lambda closed-loop control operation. Term. 24 of control unit connected to lambda sensor.	CO = <u>0.6 ... 1.2 %</u>	G 21



Signal on idle actuator

A15

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



A16

Rapid diag. chart for univ. test adapter
Porsche 911 Carrera



2. TEST SPECIFICATIONS

- Idle speed: 750...850 min⁻¹
(on test socket, connect Term. B and C) **C7**
- Exhaust adjustment:
CO-reading with engine
at normal operating
temperature, intake
air temperature 1.0...1.5 vol. % CO
15°...35°C:
SW/SWITZ/AUS: 0.5...1.0 vol. % CO
USA/JAPAN: 0.6...1.0 vol. % CO
Measure before catalytic converter, disconnect lambda
sensor plug.
- Fuel pressure: 2.3...2.7 bar
- Fuel pump delivery: min. 950 cm³/30 s
- Electric fuel-injection
valve
Internal electrical
resistance: 2...3 Ω
- Air-flow sensor
Resistance between
Term. 7 and Term. 6: 8 Ω...1000 Ω
(deflect air-flow
sensor flap)
Term. 9 and Term. 6: 500 Ω...800 Ω **C5**
- Idle actuator
Internal electrical
resistance at 20° C:
Term. 4 to Term. 5 17...19.5 Ω
Term. 4 to Term. 3 19...21.5 Ω

For setting values for valve clearance and other technical engine data, see Equipment and Autodata microfiche.



● Temperature sensor 1 (NTC I - Air):

C7

Internal electrical resistance

at +15°C...+30° C:

1.45...3.3 k Ω

measure on the air-flow sensor

between Term. 22 and Term. 6

at + 80° C:

280...360 Ω

Temperature sensor II (NTC II-Engine):

Internal electrical resistance

at +15° C...+30° C:

1.45...3.3 k Ω

at + 80° C:

280...360 Ω

● Engine speed sensor and reference mark sensor

C9

Internal electrical resistance:

0.6...1.6 k Ω

● Throttle valve switch

C7

Resistance value of idle contact

(Term. 2 and Term. 43):

0 Ω

Full-load contact (Term. 3

and Term. 43):

0 Ω

● Altitude sensor

C7

Over 1000 m elevation:

Contact closed

0 Ω

Less than 1000 m elevation:

Contact opened

∞ Ω

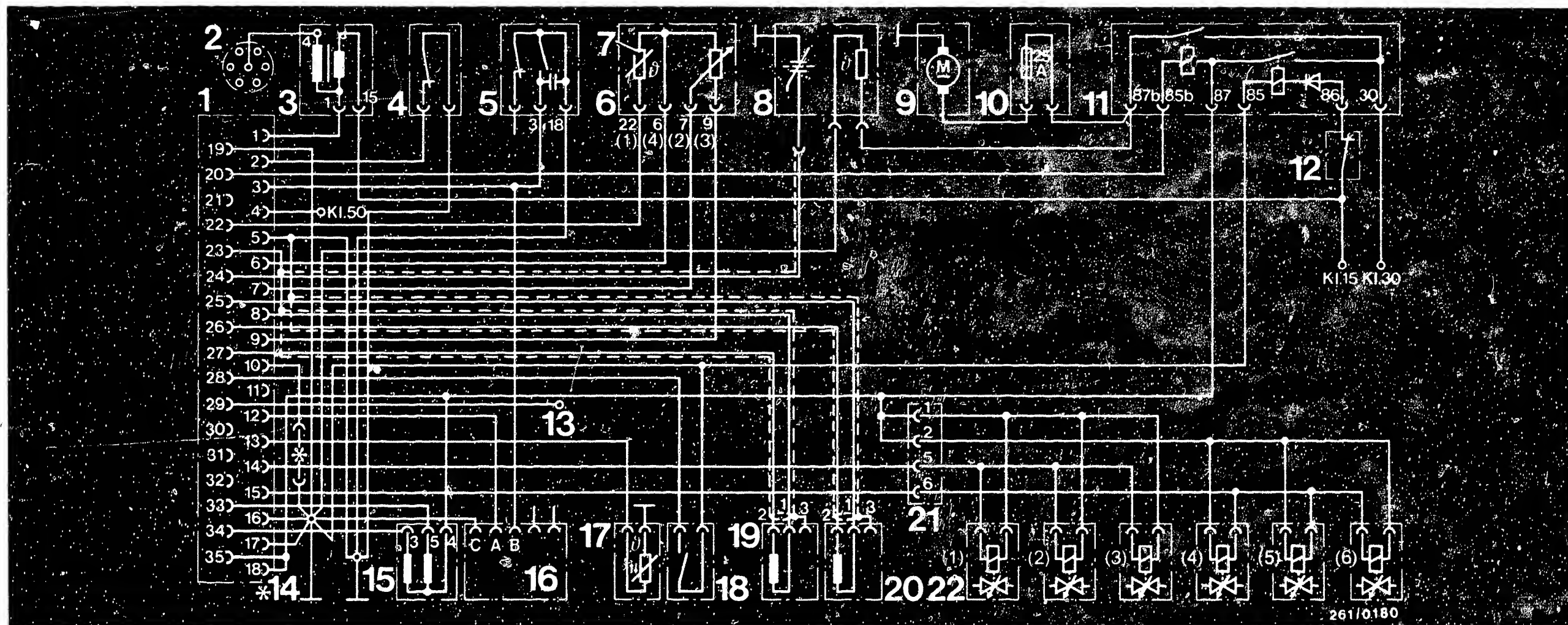
Heating coil of the lambda

sensor, measured on the 2-

pole plug:

approx. 6...20 Ω

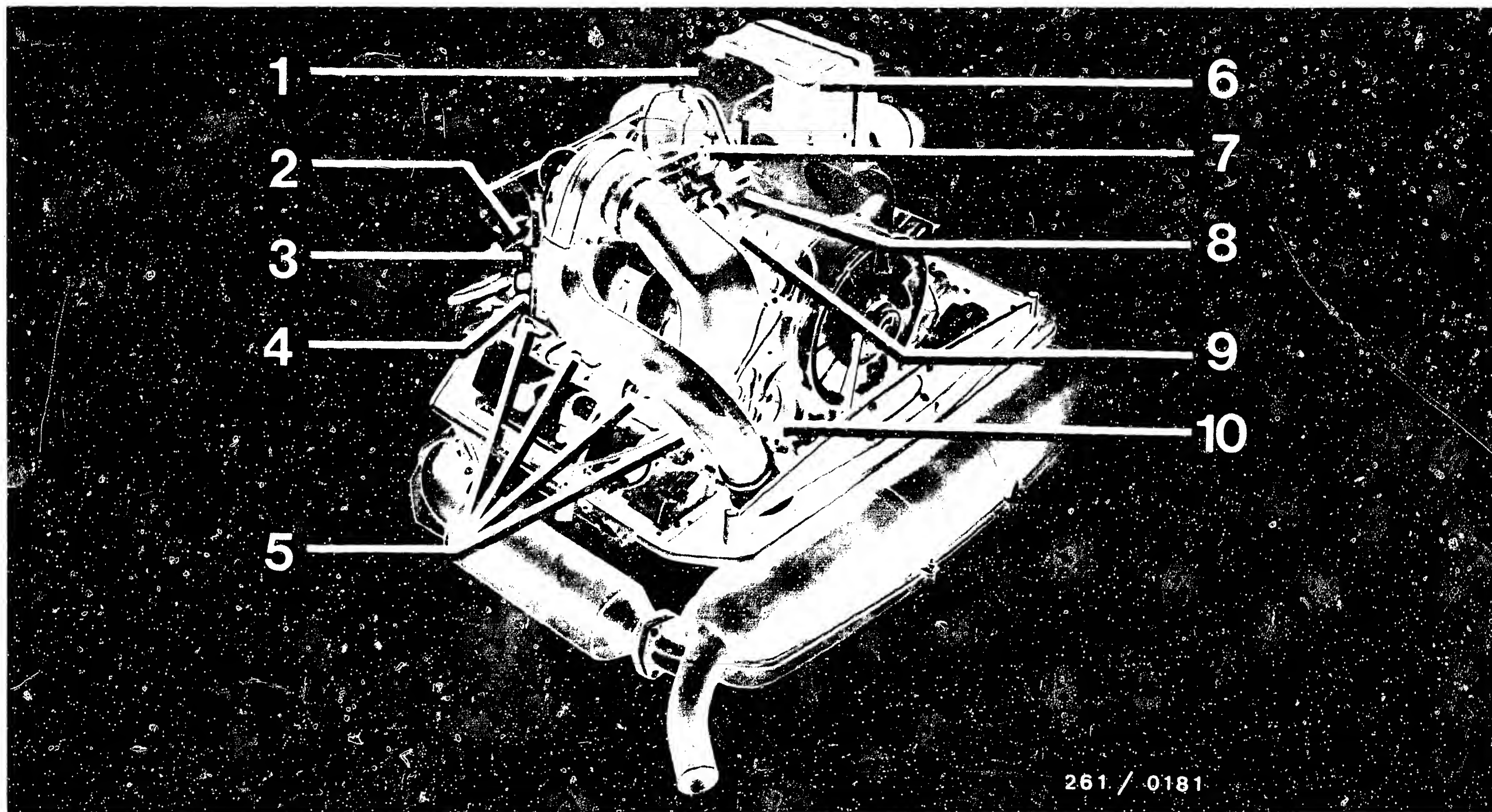




3. ELECTRICAL CONNECTION DIAGRAM

- | | | |
|---|-------------------------------------|--|
| 1 = Motronic control unit | 10 = In fuse box, fuse No. 16 | 16 = Test plug |
| 2 = High voltage distributor | 11 = Pump relay | 17 = NTC II (Temperature sensor, engine) |
| 3 = Ignition coil | 12 = Alarm unit | 18 = Altitude sensor |
| 4 = Microswitch (idle contact) | (if installed in series production) | 19 = Rotational speed sensor |
| 5 = Throttle valve switch (full-load contact) | 13 = to air conditioner (+) | 20 = Reference mark sensor |
| 6 = Air-flow sensor | 14 = connection (plugged in | 21 = Plug connection in the engine compartment |
| 7 = NTC I (Temperature sensor, air) | in California and Japan models) | 22 = (1,2,3,4,5,6) = |
| 8 = Heated lambda sensor | 15 = Idle actuator | Electric fuel-injection valves |
| 9 = Fuel pump | | K1. = Term. |





261 / 0181

4. INSTALLATION POSITION OF THE COMPONENTS

- 1 = Air-flow sensor
- 2 = Pressure regulator
- 3 = Plug from temperature sensor, engine (NTC II)
- 4 = Plug from reference mark and rotational speed sensor

- 5 = Electric fuel-injection valves
- 6 = Air filter
- 7 = Throttle valve switch

- 8 = Idle actuator
- 9 = Diagnosis connection
- 10 = High voltage distributor

A21

Installation position of the components
Porsche 911 Carrera



A22

Installation position of the components
Porsche 911 Carrera

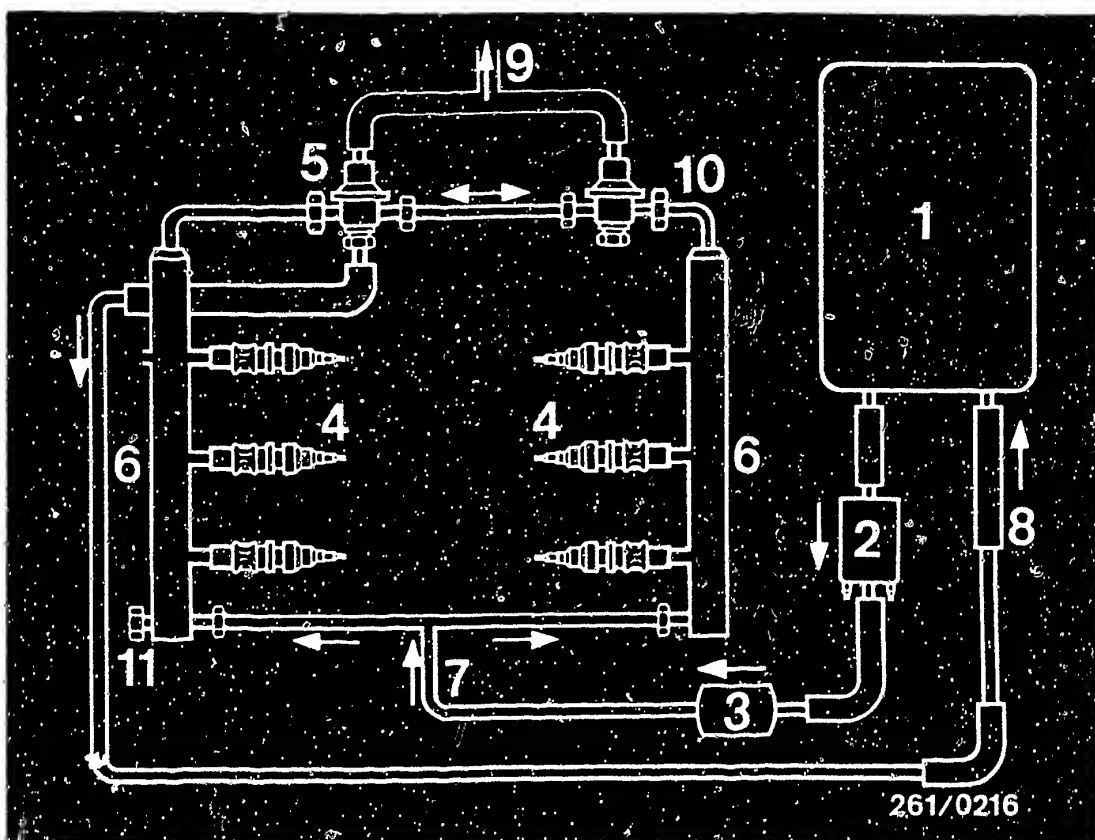


Installation position of the components (continued)

Information on installation position is always looking in the direction of forward vehicle travel.

- | | |
|---|--|
| ● Reference mark and rotational speed sensor: | In a shared mounting on the crankcase |
| ● Relay 1 (fuel pump relay) combined with | |
| ● Relay 2 (main relay): | Under the driver's seat |
| ● Control unit: | Under the driver's seat |
| ● Temperature sensor I: | In the air-flow sensor |
| ● Temperature sensor II (engine): | In the cylinder head of the third cylinder |
| ● Central ground points: | <ol style="list-style-type: none">1. On the intake manifold, Cylinder 12. On the bracket for the fuel filter3. Grounding strip between vehicle body and engine |
| ● Electric fuel pump: | In front of the front axle cross beam |
| ● Fuel filter: | On the left in the engine compartment |
| ● Fuel vaporizer: | At the end of the fuel distributor on the right, near Cylinder 6 |
| ● Pressure regulator: | At the end of the fuel distributor on the left, near Cylinder 4 |
| ● Altitude sensor: | Under the driver's seat |
| ● Fuses | In the trunk, on the left |
| ● Lambda sensor: | In the shared exhaust pipe |
| ● Plug connection for lambda sensor: | On the left in the engine compartment, near the sensor plug connections. |





5. Diagram of fuel lines

- 1 = Fuel tank
- 2 = Fuel pump
- 3 = Fuel filter
- 4 = Solenoid-operated injection valves
- 5 = Pressure regulator
- 6 = Fuel-distributor pipe
- 7 = Fuel delivery line
- 8 = Fuel return line
- 9 = To intake manifold
- 10 = Fuel-line pressure-damper
- 11 = Test connection



6. TEST EQUIPMENT AND TOOLS

<u>Name</u>	<u>Designation</u>	<u>Part No.</u>
Universal test adapter	ETT 018.01	0 684 101 801
Adapter lead, general		1 684 463 124
Adapter lead USA/Japan		1 684 463 128
Motortester	e.g. MOT 201	0 684 000 201
Diagnosis cable for measuring timing advance angle		1 684 463 095
Exhaust-gas analyzer	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Multimeter (analog reading, internal resistance min. 20 k Ω /V)		Commercially available e.g. type MA 2H from Metrawatt or Chinaglia, Cortina model
Pressure gauge 6 bar	Quality class 1.0	1 687 231 154
or Pressure tester or Pressure tester (no longer available)	0.1 bar graduations	KDJE-P 100 KDEP 1034
Three-way line as connection piece for KDJE-P100 and KDEP 1034		KDJE-P100/13

B1

Test equipment and tools

Porsche 911 Carrera



<u>Description</u>	<u>Part No.</u>
Feeler gauge for measuring the sensor air gaps (up to 1 mm)	Commercially available
Lubricant for engine-speed and reference- mark sensors	Molykote Longterm 2, commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Electric connecting cable (test lead) for direct connection of the components under test, e.g. injection valves	KDJE 7450/70

For USA/Japan:

Tool kit for taking off and putting on the idle-CO anti-
tamper device on the air-flow sensor, e.g. No. 13/1090
from

Cartool
Hans Schubert KG
Unterer Grasweg 88
D - 8070 Ingolstadt

or from BMW of America

Assembly paste VS 14016 for lambda sensor and exhaust gas screw plug Crimping clamp for crimping off fuel and air hoses.	5 964 082 105
--	---------------



7. IMPORTANT GENERAL INFORMATION

This information must be observed in order to prevent damage to the engine, control unit or ignition coil and for the safety of personnel.

- Never start engine without securely connected battery.
- Incorrect polarity of the supply voltage, e.g. by incorrect connection of the battery or ignition coil, can lead to irreparable damage to the control unit.
- Do not use a fast charger for starting the engine.

Use only a second 12 V battery and jump leads.

Caution! Owing to different requirements of vehicle manufacturers with regard to electronic products we advise you not to use 24 V batteries as an aid for starting. Follow the vehicle owners manual.

- Disconnect the battery from the vehicle electrical system before fast charging.
- When charging the battery in the vehicle or jumping for start, follow instructions in the operator's manual for the battery charger and instructions from the vehicle manufacturer.
- Never disconnect the battery from the vehicle electrical system with the engine running.
- Do not short-circuit ignition coil Term. 1 to ground (e.g., to shut off the engine). The ignition coil and under some circumstances the control unit are destroyed.



- Never connect the positive pole of the battery to ignition coil Term. 1. The control unit is destroyed.
- Never disconnect or connect the wiring harness of the control unit with the ignition switched on.
- Remove the control unit at temperatures above 80° C (paint-drying oven).
- The control unit must be taken out for welding work (electrical spot welding).
- Disconnect the relay set for a compression pressure test. That prevents an undesired injection of fuel through the fuel-injection valves.
- When installing an alarm unit follow the instructions in the installation manual for Motronic vehicles or the After-Sales Service Instructions SIS AII-500.
- In so doing, make certain that external fields (e.g. from ignition lines) do not interfere with the alarm relay and set it off in error.



W A R N I N G !

High performance ignition system, dangerous high voltage and low voltage!



The above sticker has the following meaning:

The Motronic contains a high-performance ignition system which can be dangerous if live parts or terminals are touched (both on the primary as well as secondary sides).

The ignition must always be switched off when working on the ignition coil (switch off ignition/voltage source). Such work includes:

- Connection of engine testers (timing light, dwell-tach tester, ignition oscilloscope etc).
- Replacement of parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc).

If, when testing the ignition system or when performing adjustments on the engine (e.g. carburetor), it is necessary to switch on the ignition (switch on ignition/voltage source), the above-mentioned dangerous voltages occur over the entire system.

There is, therefore, danger of accident not only on the individual components of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), on plug-in connections and on testers.



8. TROUBLE-SHOOTING

The following trouble-shooting programs are designed to enable the workshop employees using the Universal test adapter and other suitable testers to quickly detect causes of trouble on the Motronic.

Depending on the level of training and experience of the mechanic a choice can be made between the following procedures:

- Detailed, step-by-step trouble-shooting for employees with little experience or practice on Motronic vehicles.
- Pin-pointed direct trouble-shooting for trained and experienced employees who have a great deal of practice on Motronic vehicles.

Both trouble-shooting programs start by checking the electrical/electronic part of the Motronic using the Motronic test adapter ETT 018.01. This makes it possible within a short space of time to check the electrical operation of the wiring harness with the connected components (including control unit) and to quickly locate faults.

If no fault is found using the Motronic test adapter, it is necessary to continue with the detailed or the direct trouble-shooting program.

C3**C5****C1**

Trouble-shooting
Porsche 911 Carrera

**C2**

Trouble-shooting
Porsche 911 Carrera



8.1 Detailed, step-by-step trouble-shooting

8.1.1 Test with Motronic test adapter

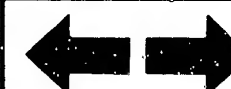
This test must come at the start of the test program and must be performed from beginning to end.

8.1.2 Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the right-hand column gives the first coordinate of the respective detailed trouble-shooting program.

The trouble-shooting program consists of logically ordered test steps for all individual components of the Motronic. If, after completing the trouble-shooting program for an assumed symptom, the fault has not been located or remedied, choose a new fault symptom and work through the respective program.

<u>Customer complaints (fault symptom)</u>	<u>Test with test adapter</u>	<u>Coordinates</u>
1. Engine fails to start or starts only with great difficulty	C 11	H 1
2. Engine starts but then dies	C 11	H 13
3. Uneven engine idle	C 11	J 1
4. Poor throttle take-up	C 11	J 17
5. Engine missing under all operating conditions	C 11	K 1
6. Fuel consumption too high	C 11	K 11
7. No maximum engine power	C 11	K 17
8. CO concentration at idle too high or too low	C 11	L 5



8.2 Pin-pointed, direct trouble-shooting

8.2.1 Test with Motronic test adapter

The test with the test adapter must come at the start of the test program and must be performed from beginning to end.

8.2.2 Trouble-shooting according to customer complaints

The table below contains various fault symptoms with several possible causes of the fault in each case. The references given on the left indicate the first coordinate of the test step for the respective individual component of the Motronic. If, after testing the individual components, the fault has not been located or remedied, it is necessary to choose a new fault symptom.

Customer complaint (fault symptoms)

Engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Uneven engine idle, idle speed incorrect								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. No maximum engine power								
8. CO concentration at idle too high or too low								
								Cause (component fault)
C 11	C 11	C 11	C 11	C 11	C 11	C 11	C 11	Test with Motronic test adapter
●*)								Relay combination (main and pump relay) defective
③*)								Electric fuel pump not operating
H 7	H 17	J 7	J 23					Idle actuator defective
		●*)						Microswitch (idle contact) requires adjustment or is defective
H 9	H 19	J 3	J 21	K 7	K 15	K 23	L 7	Air-flow sensor defective

C5Trouble-shooting
Porsche 911 Carrera**C6**Trouble-shooting
Porsche 911 Carrera

Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Uneven engine idle, idle speed incorrect

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. No maximum engine power

8. CO concentration at idle too high or too low

Cause (component defect)

H 9	H15	J 5	J 21				L 9	Leak in intake system
H 3		J 9						Electric fuel-injection valves defective
● *)		● *)				K 21		Fuel pressure too low or zero, pressure regulator is not functioning
		● *)			● *)		● *)	Fuel pressure too high, pressure regulator is not functioning
				K 5		L 1		Fuel delivery too small
	● *)				● *)		● *)	Temperature sensor I (air) or temperature sensor II (coolant) defective
						K 19		Throttle valve is not opening completely
				K 3				Poor central ground, loose contacts, defective plug connections
H 9	H 15	J 5	J 21			L 3	L 9	No continuity in wiring harness and plug connections
						● *)		Throttle-valve switch (full load contact) requires adjustment or is defective
		J11					L11	CO-exhaust gas adjustment too rich, idle adjustment
		J11	● *)				L11	CO-exhaust gas adjustment too lean, idle adjustment
		● *)	● *)				● *)	Altitude sensor defective

C7

Trouble-shooting
Porsche 911 Carrera



C8

Trouble-shooting
Porsche 911 Carrera



Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Uneven engine idle, idle speed incorrect								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. No maximum engine power								
8. CO concentration at idle too high or too low								
Cause (component defect)								
●*)								Rotational speed sensor defective
●*)								Reference mark sensor defective
				K 9				Recheck alternator, interference suppressor
H 3		J 3	J 19	K 3	K13	K19	L 7	Recheck secondary pictures
●*)	●*)	●*)	●*)	●*)	●*)	●*)	●*)	Control unit defective
		●*)					●*)	Recheck lambda control

●*) If you have performed the test with Motronic test adapter, this component has already been tested. Continue testing with the next component in this column.
 However, if you have arrived at this point through a component complaint or through the test-specifications table, you must test this component with the Universal test adapter. The test program for the test adapter begins on Coordinate C 11 and must be performed from beginning to end.

C9

Trouble-shooting
Porsche 911 Carrera



C10

Trouble-shooting
Porsche 911 Carrera



9. TEST WITH UNIVERSAL TEST ADAPTER ETT 018.01

(0 684 101 801) and adapter cable for Motronic

Connect the Motronic test adapter to the Motronic wiring harness (ignition must be off).

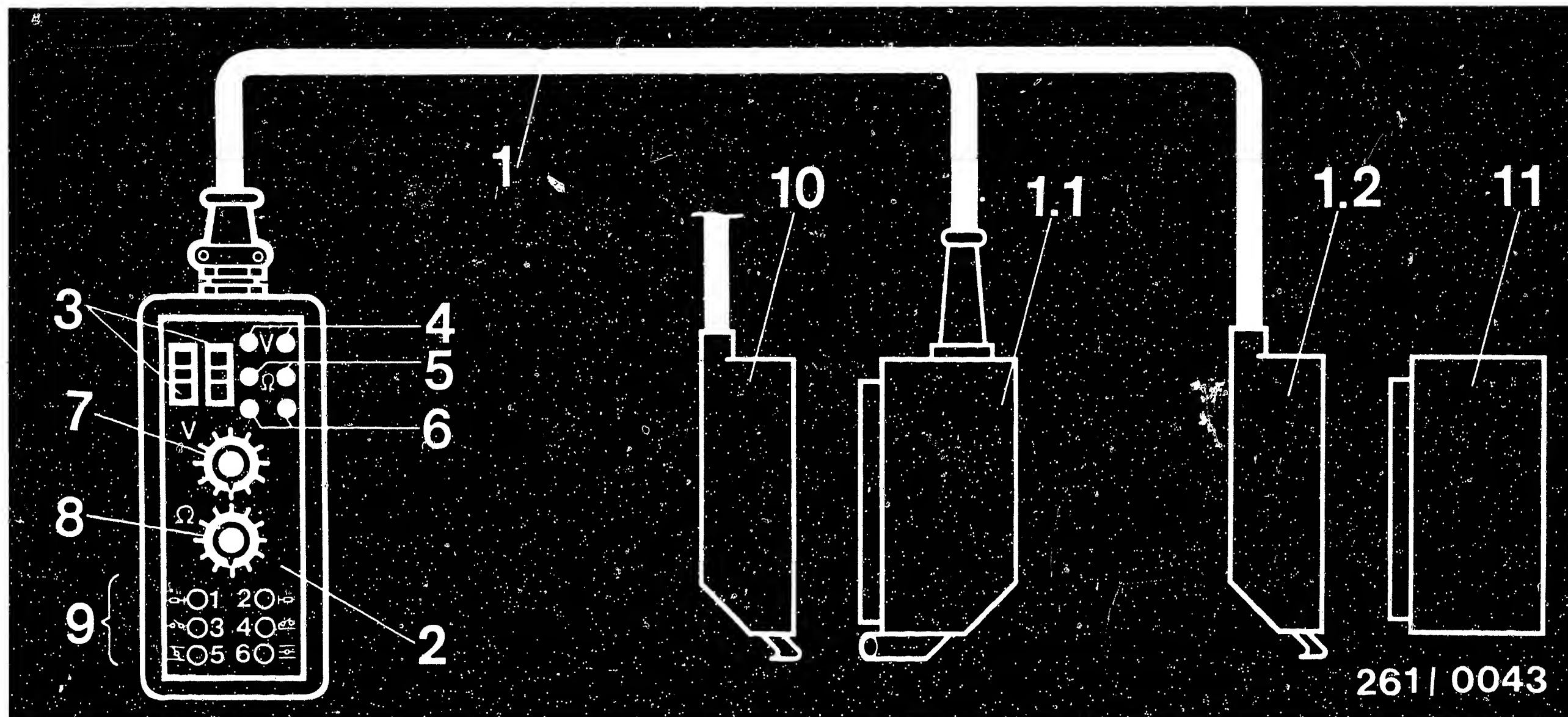
For testing the wiring harness and the connected components, only the Motronic wiring harness must be connected - but not the control unit. Be sure to observe the instructions in the test chart!

A pointer instrument for the voltage and resistance measurements (multimeter) as well as the motortester must be connected to the test adapter in order to make the measurements.

The individual test steps are selected with the program selector switch. The symbols V and Ω show the operator whether voltage or resistance is being measured. Some switch positions are necessary for simulation of operating conditions with engine running. By pressing the pushbuttons it is possible, with the control unit connected and the engine running, to simulate given operating conditions. Thus, for example, with the engine at normal operating temperature it is possible by pressing the push-button T1 to make the control unit "think" that the engine temperature is -20°C. It is then possible to evaluate the reaction of the control unit on the motor-tester.

If necessary, the circuit diagram can be used for trouble-shooting.





261 / 0043

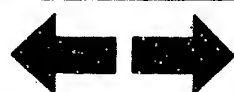
Universal test adapter with adapter lead for Motronic

- 1 = Adapter lead
- 1.1 = Connection to wiring harness
- 1.2 = Connection to control unit
- 2 = Universal adapter (Part No.: 0 684 001 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for voltage measurement)
- 5 = Test sockets (for resistance measurement)
- 6 = Test sockets (not occupied)
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Button panel for simulation of operating conditions
- 10 = Motronic wiring harness
- 11 = Control unit
- Button 1 = NTC II (engine), cold (-20° C)
- Button 2 = NTC II (engine), warm (+80° C)
- Button 3 = Pump energization
- Button 4 = Not occupied
- Button 5 = Throttle-valve idle contact
- Button 6 = Throttle-valve full-load contact

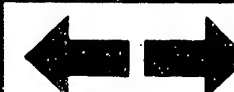
C12

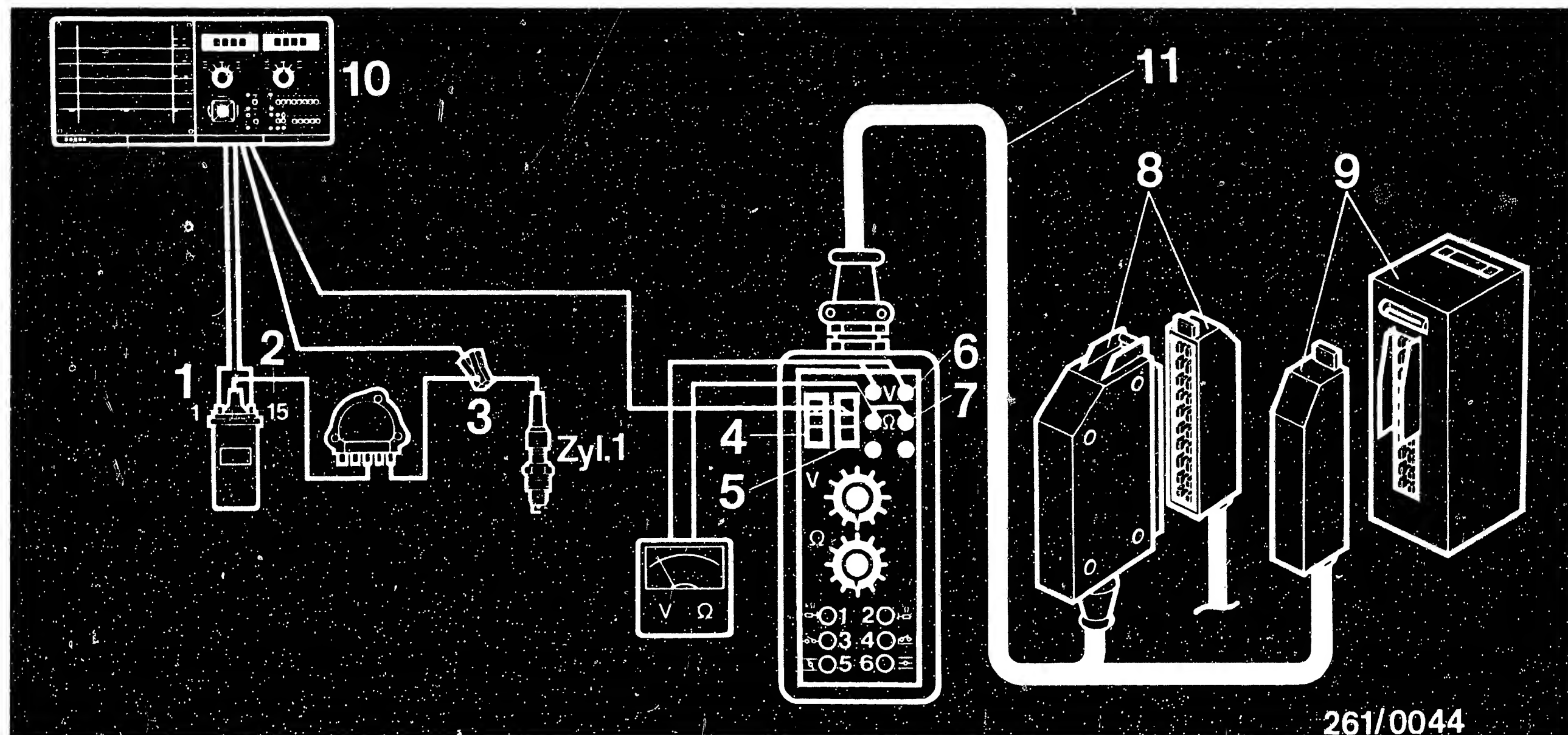
Test with universal test adapter
Porsche 911 Carrera



C13

Test with universal test adapter
Porsche 911 Carrera





261/0044

Connection diagram for test adapter

- | | |
|--|--|
| 1 = Green clip to ignition coil term. 1 | 6 = Connection of voltmeter to V sockets (red = +, black = ground or negative) |
| 2 = Yellow clip to ignition coil term. 15 | 7 = Connection of ohmmeter to black Ω sockets (blue) |
| 3 = Induction-type clamp-on pickup over H.T. ignition cable of cylinder 1 | 8 = Connection to Motronic wiring harness |
| 4 = Red connection socket (test well) for red terminal of motortester | 9 = Connection to Motronic control unit |
| 5 = Black connection socket (test well) for black terminal of motor tester | 10 = Motortester |
| | 11 = Adapter cable for Motronic |

C14

Test with universal test adapter
Porsche 911 Carrera



C15

Test with universal test adapter
Porsche 911 Carrera



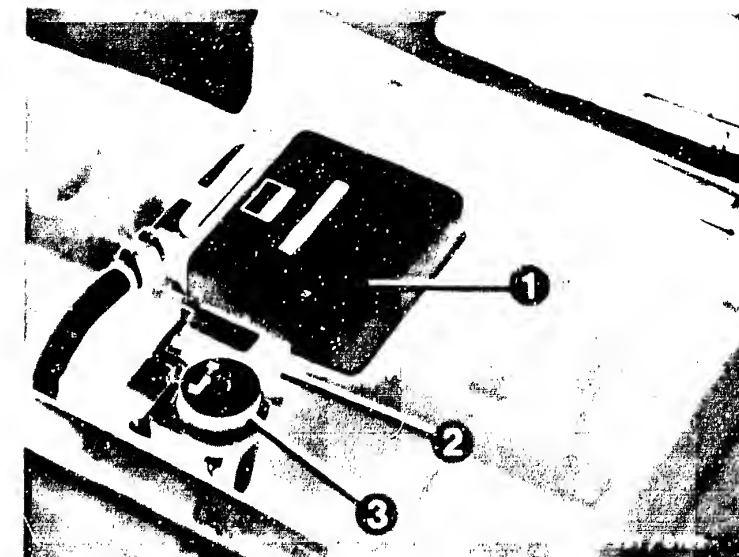
Preparations for test with Universal test adapter

1. Remove the control unit and connect the test adapter

Installation position of the control unit: Under the driver's seat.
the steering column.

To remove the control unit, force back the detent and hinge up and remove the plug in the direction of the arrow.

The control unit is fastened with 4 nuts.



- 1 = Control unit
- 2 = Main and pump relays
- 3 = Altitude sensor
(only in USA model)

2. Disconnect the pump fuse (on left in trunk, No. 16).

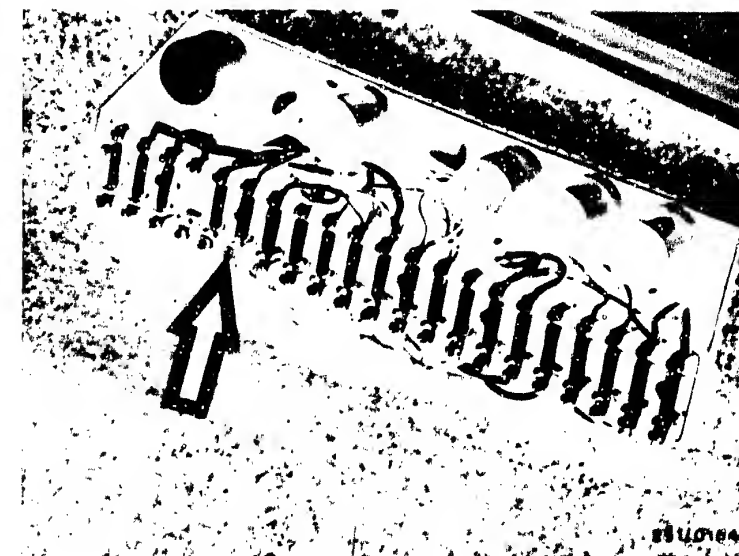
Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

Note:

In the following test steps, the column "operation" has a white border to show which operation has to be changed compared with the previous operation.

Arrow = Pump fuse No. 16



C16

Testing with universal test adapter
Porsche 911 Carrera



C17

Testing with universal test adapter
Porsche 911 Carrera

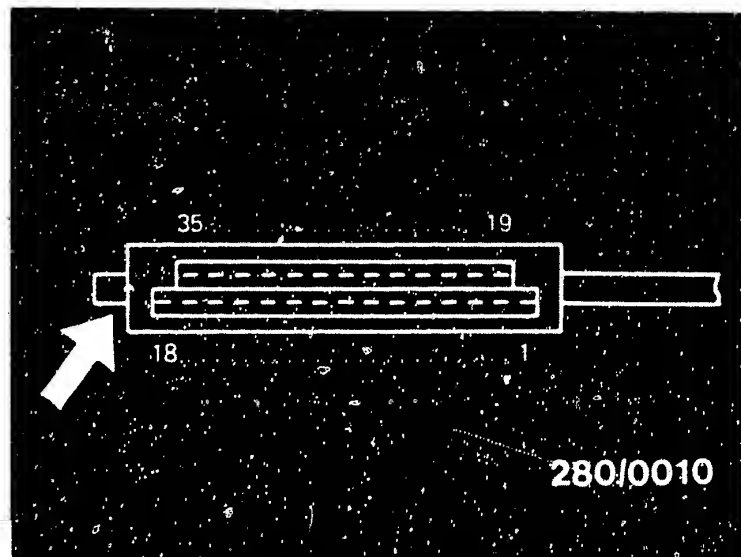


Test step 1: Switch off ignition. Disconnect control unit and pump fuse No. 16.		
Operation	Reading	Testing
Program switch position "V"	<div> <div>greater than 1 M Ω</div> <div> <div>yes</div> <div>no</div> </div> <div>Continue testing with next test step.</div> </div>	Component: Engine-speed sensor
Program switch position "I"		
Measuring equipment: Ohmmeter		Operation:
Measuring range: 10 M Ω		Insulation between Term. 8 and ground
Connection: Test sockets		Malfunction: Resistance less than 1 M Ω
Operation in vehicle: Switch off ignition.		

Trouble-shooting:

Resistance reading approx. 0 Ω :
Check Lead 8 for short circuit to ground.

Resistance reading 0.6...1.6 k Ω :
Check Lead 27 for short circuit to ground.



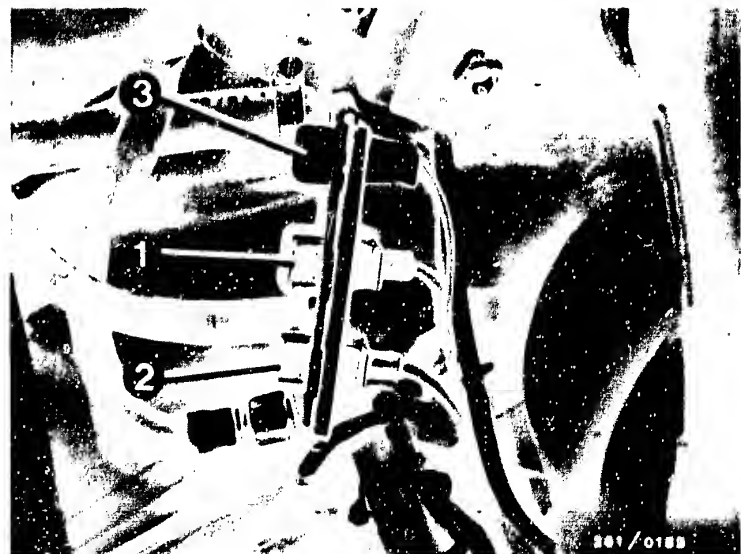
Top view of plug on 35-pole multiple of Motronic wiring harness

Arrow = Lug with mechanical cooling

1 = Plug connection for rotational speed sensor with identification DG

2 = Plug for reference mark sensor with identification BG

3 = Plug connection for temperature sensor II (engine)



C18

Testing with universal test adapter
Porsche 911 Carrera



C19

Testing with universal test adapter
Porsche 911 Carrera

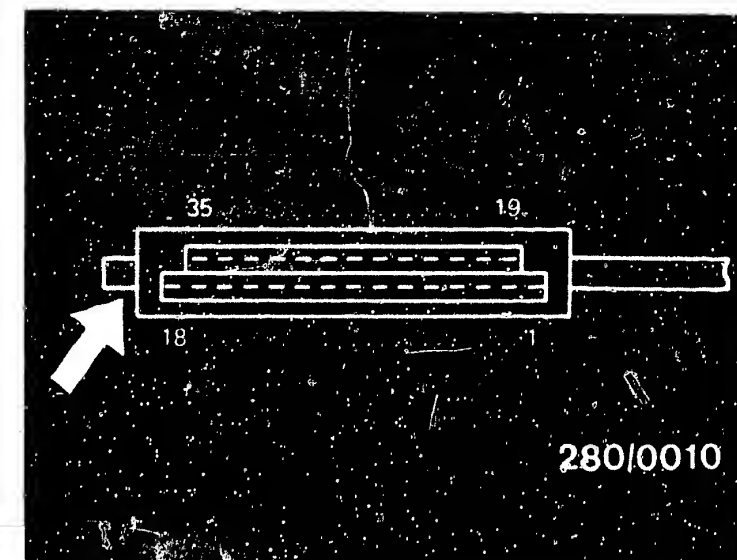


Test step 2			
Operation		Reading	Testing
Program switch position "V"	↓		Component: Reference-mark sensor
Program switch position "E"			
	2	Greater than 1 M Ω	
Measuring equipment: Ohmmeter	yes ↓		Operation: Insulation between Term. 25 and ground
Measuring range: 10 M Ω			
Connection: Test sockets Ω			Malfunction: Resistance less than 1 M Ω
Operation in vehicle: Switch off ignition.			
		no ↓	
		Continue testing with next test step.	

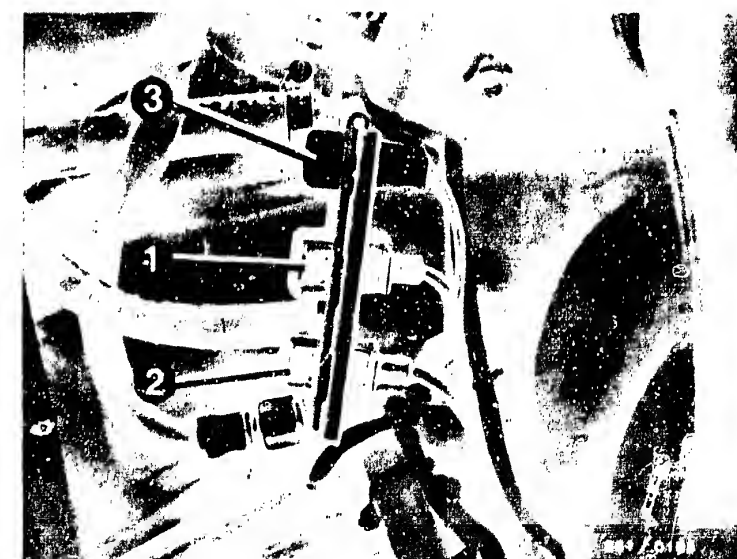
Trouble-shooting:

Resistance reading approx. 0 Ω :
Check lead 25 for short circuit to ground.

Resistance reading 0.6...1.6 k Ω :
Check lead 26 for short circuit to ground.



Top view of plug on 35-pole multiple of Motronic wiring harness
Arrow = Lug with mechanical cooling
1 = Plug connection for rotational speed sensor with identification DG
2 = Plug for reference mark sensor with identification BG
3 = Plug connection for temperature sensor II (engine)



C20

Testing with universal test adapter
Porsche 911 Carrera



C21

Testing with universal test adapter
Porsche 911 Carrera



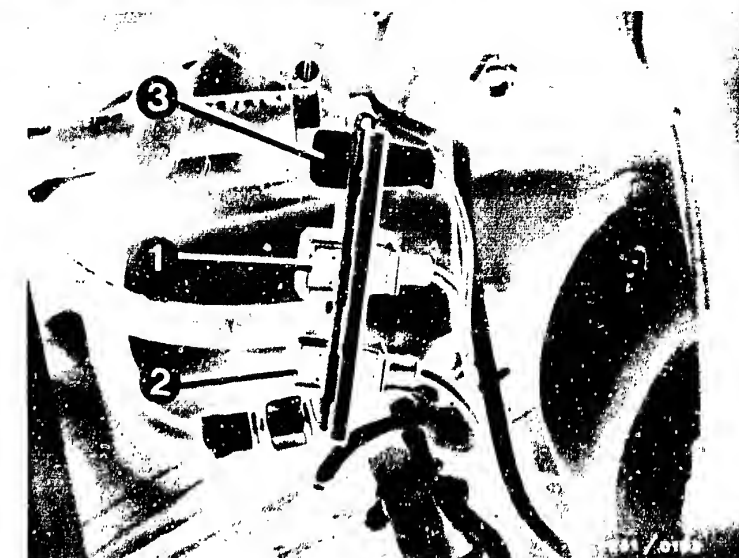
Test step 3			
Operation		Reading	Testing
Program switch position "V"	↓	0.6...1.6 kΩ	Component: Engine-speed sensor
Program switch position "Ω"	3		
Measuring equipment: Ohmmeter		<div><div>yes</div><div>↓</div><div>Continue testing with next test step.</div></div> <div><div>no</div><div>↓</div><div></div></div>	Operation: Winding resistance between Term. 8 and Term. 27
Measuring range: 0 to 10 kΩ			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition			
			Malfunction: Resistance outside tolerance

Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection: Corrosion, loose contact (spring contacts must not allow themselves to be pushed back)
- Check leads from engine-speed sensor Term. 8 and Terms. 27 to multiple plug Term. 8 and Term. 27.
- Replace sensor.

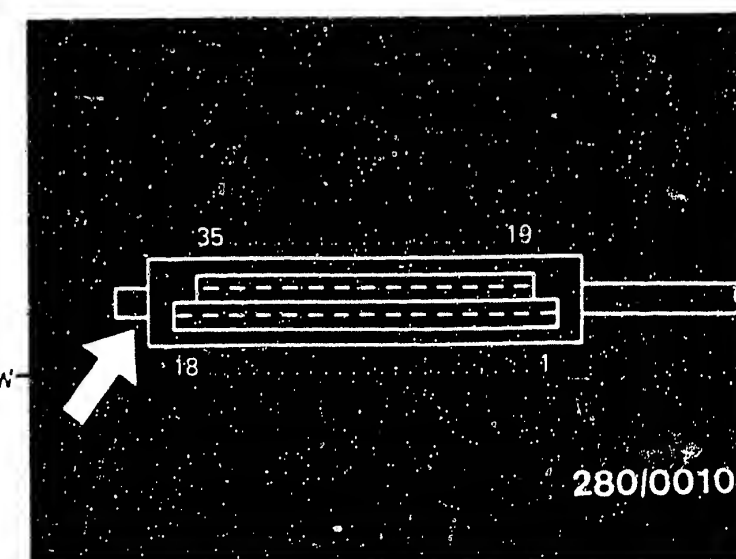
To replace the sensors, undo the plug-in connection and unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits on the sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor. Caution! Do not loosen the mounting.

Continued on D1/D2



Top view of plug on 35-pole multiple of Motronic wiring harness
Arrow = Lug with mechanical cooling

- 1 = Plug connection for rotational speed sensor with identification DG
- 2 = Plug for reference mark sensor with identification BG
- 3 = Plug connection for temperature sensor II (engine)



280/0010



Trouble-shooting, test step 3 (continued)

To take out the plug connection in the mounting, release the mechanical lock with a screwdriver and pull the plug connection out in a downward direction.

Before putting the sensors in, make certain that no metallic parts are clinging to the sensor (the sensors contain permanent magnets).
Degrease the sensors with Molykote Longterm 2.

Do not mistake the sensors one for the other when installing!

The rotational speed sensor is located in front of the reference mark sensor, looking in the direction of forward vehicle travel.

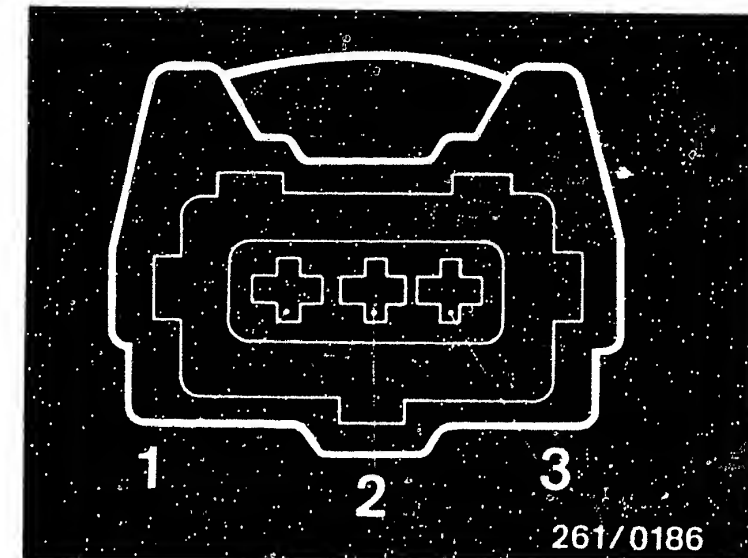
Watch the identification marking:

- Reference mark sensor with identification BG on the leads.
- Rotational speed sensor with identification DG on the leads.

The sensors are plugged into the holes as far as they will go and are secured.
Do not use force when inserting.

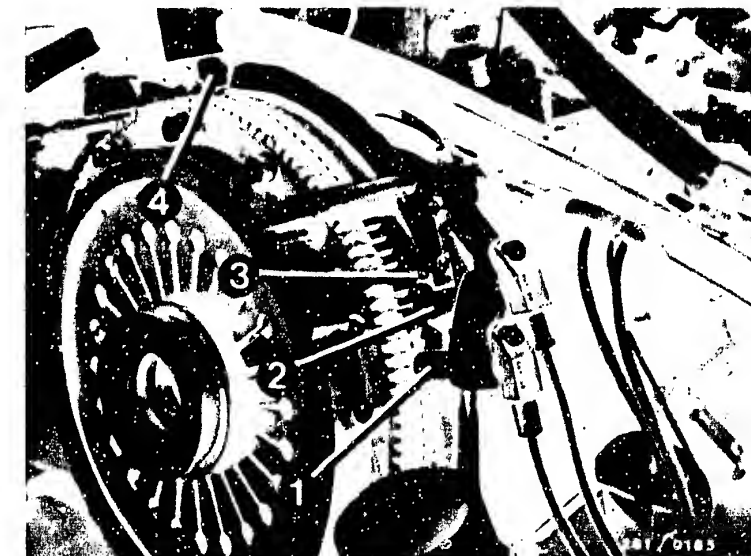
When installing, make sure that the connectors are not mixed up.
Make sure that the spring contacts in the plug are seated properly and that they latch in position.

Spring contacts must not allow themselves to be pushed back.



Top view of the plug for sensors
3 = DG → Term. 23, BG → Term. 5
2 = DG → Term. 27, BG → Term. 26
1 = DG → Term. 7, BG → Term. 25

1 = Rotational speed sensor
2 = Reference mark sensor
3 = Reference mark pin
4 = Position sensor



D1

Testing with universal test adapter
Porsche 911 Carrera



D2

Testing with universal test adapter
Porsche 911 Carrera



Test step 4			
Operation		Reading	Testing
Program switch position "V"	↓	0.6...1.6 kΩ	Component: Reference-mark sensor
Program switch position "Ω"	4		
Measuring equipment: Ohmmeter		yes ↓ no ↓	Operation: Winding resistance between Term. 25 and Term. 26
Measuring range: 0 to 10 kΩ			
Connection:	Ω		
Test sockets			
Operation in vehicle: Switch off ignition		Continue testing with next test step.	Malfunction: Resistance outside tolerance.

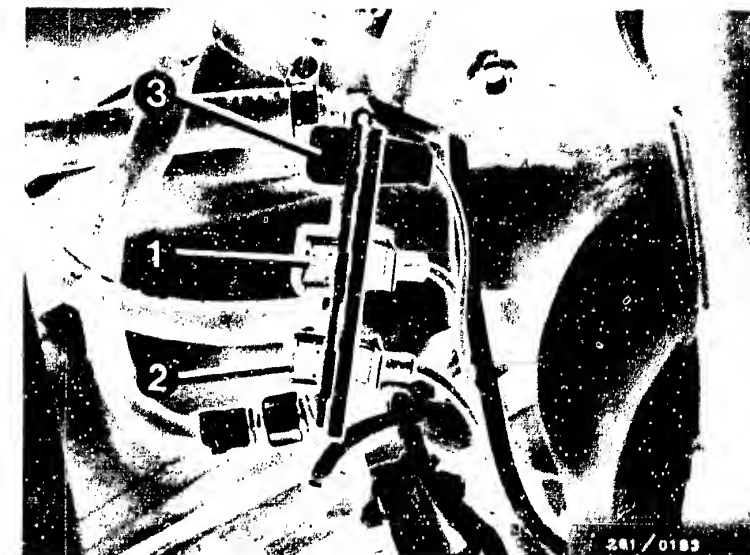
Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection for corrosion, loose contact (spring contacts must not allow themselves to be pushed back)
- Check leads from reference-mark sensor Term. 25 and Term. 26 to multiple plug Term. 25 and Term. 26.
- Replace sensor.

To replace the sensors, unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits from sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise sensor.

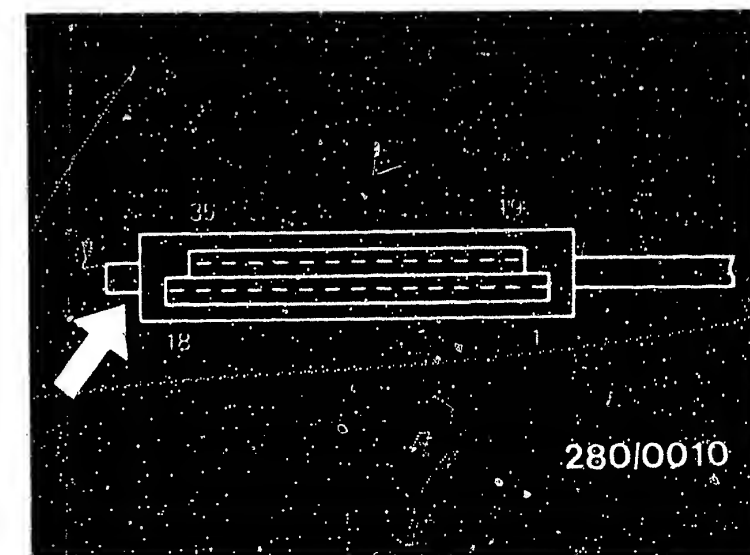
Caution! Do not loosen mounting.

Continued on D5/D6



- 1 = Plug connection for rotational speed sensor with identification DG
- 2 = Plug for reference mark sensor with identification BG
- 3 = Plug connection for temperature sensor II (engine)

Top view of plug on 35-pole multiple of Motronic wiring harness
Arrow = Lug with mechanical cooling



D3

Testing with universal test adapter
Porsche 911 Carrera



D4

Testing with universal test adapter
Porsche 911 Carrera



Trouble-shooting, test step 4 (continued)

To take out the plug connection in the mounting, release the mechanical lock with a screwdriver and pull the plug connection out in a downward direction.

Before putting the sensors in, make certain that no metallic parts are clinging to the sensor (the sensors contain permanent magnets).
Degrease the sensors with Molykote Longterm 2.

Do not mistake the sensors one for the other when installing!

The rotational speed sensor is located in front of the reference mark sensor, looking in the direction of forward vehicle travel.

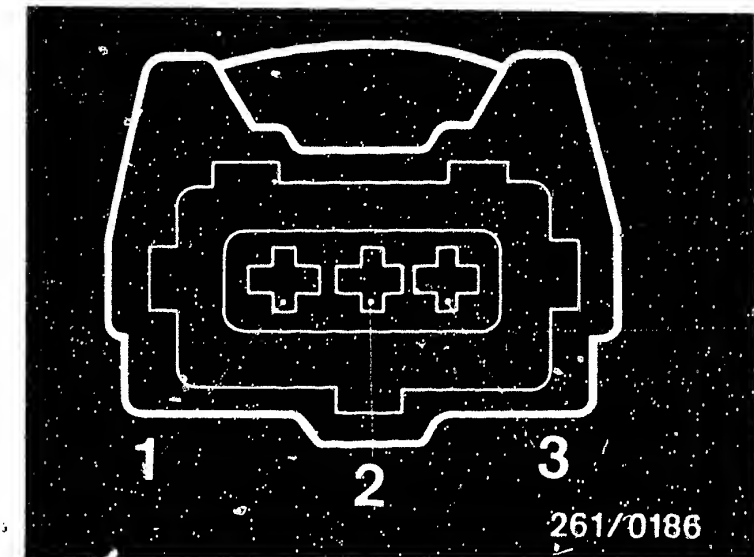
Watch the identification marking:

- Reference mark sensor with identification BG on the leads.
- Rotational speed sensor with identification DG on the leads.

The sensors are plugged into the holes as far as they will go and are secured.
Do not use force when inserting.

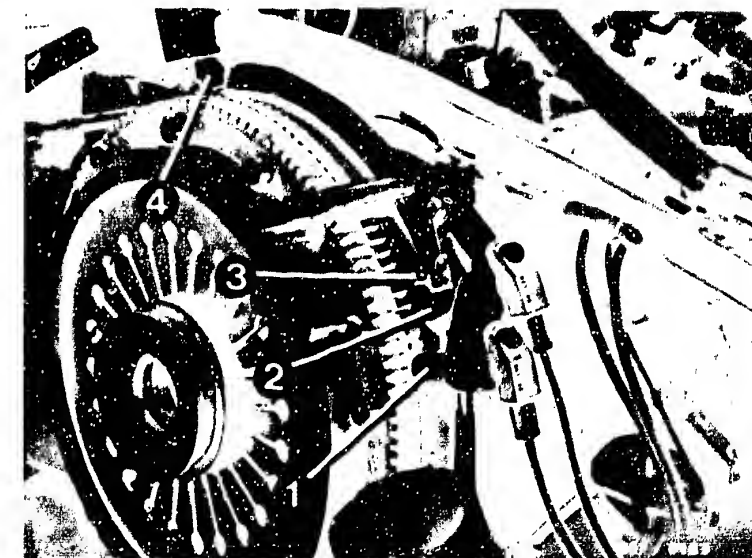
When installing, make sure that the connectors are not mixed up.
Make sure that the spring contacts in the plug are seated properly and that they latch in position.

Spring contacts must not allow themselves to be pushed back.



Top view of the plug for sensors
3 = DG → Term. 23, BG → Term. 5
2 = DG → Term. 27, BG → Term. 26
1 = DG → Term. 8, BG → Term. 25

1 = Rotational speed sensor
2 = Reference mark sensor
3 = Reference mark pin
4 = Position sensor



D5

Testing with universal test adapter
Porsche 911 Carrera



D6

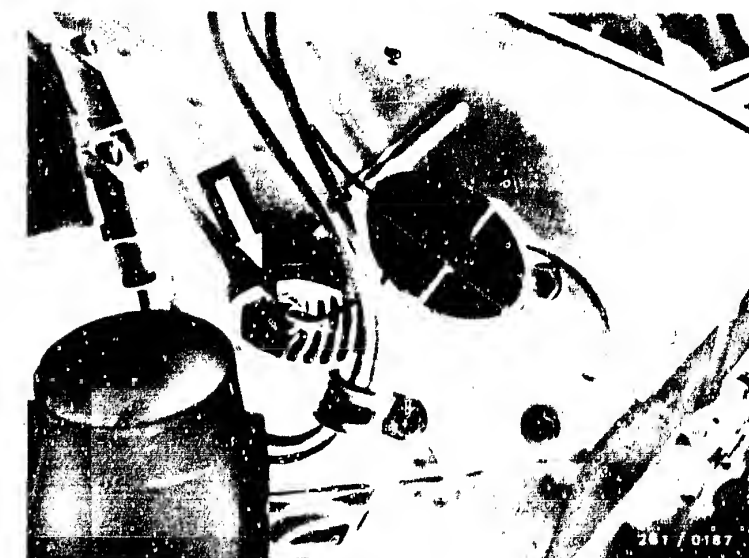
Testing with universal test adapter
Porsche 911 Carrera



Test step 5			
Operation		Reading	Testing
Program switch position "V"	↓	Reading is temperature -dependent, i.e. note engine temperature. At ambient temper- ature (+15°...+30°C): 1.45...3.3 kΩ	Component: Engine temperature sensor (NTC II)
Program switch position "A"	5		Operation: Resistance between Term. 13 and ground
Measuring equipment: Ohmmeter		With engine at normal operating temperature (approx. + 80° C): 280...360Ω	Malfunction: Resistance outside tolerance. Note temperature.
Measuring range: 0 to 10 kΩ			
Connection: Test sockets	Ω	yes ↓	
Operation in vehicle: Switch off ignition		Continue testing with next test step.	
		no	
		no	

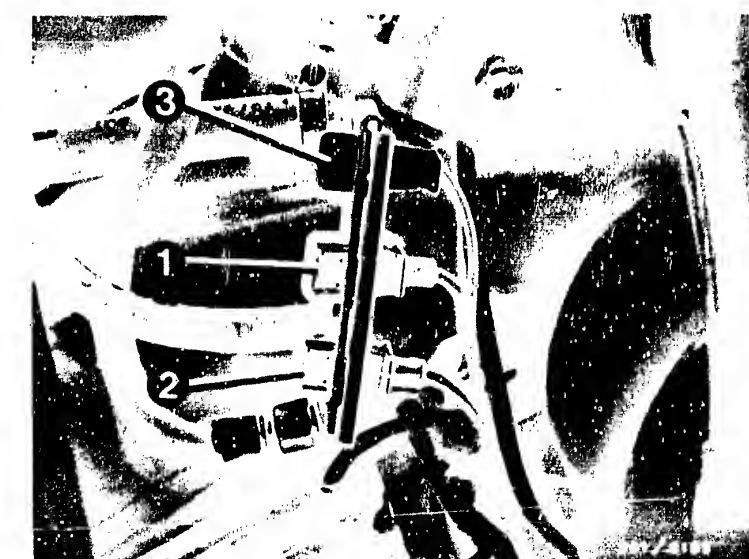
Trouble-shooting:

- Remove plug from temperature sensor and measure resistance directly. If necessary, replace temperature sensor.
- Check leads from temperature sensor to multiple plug Term. 13 and to ground terminal.
- Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back.



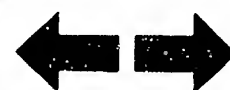
Arrow = Engine temperature sensor
(NTC II)

- 1 = Plug connection for rotational speed sensor with identification DG
- 2 = Plug for reference mark sensor with identification BG
- 3 = Plug connection for temperature sensor II (engine)



D7

Testing with universal test adapter
Porsche 911 Carrera



D8

Testing with universal test adapter
Porsche 911 Carrera

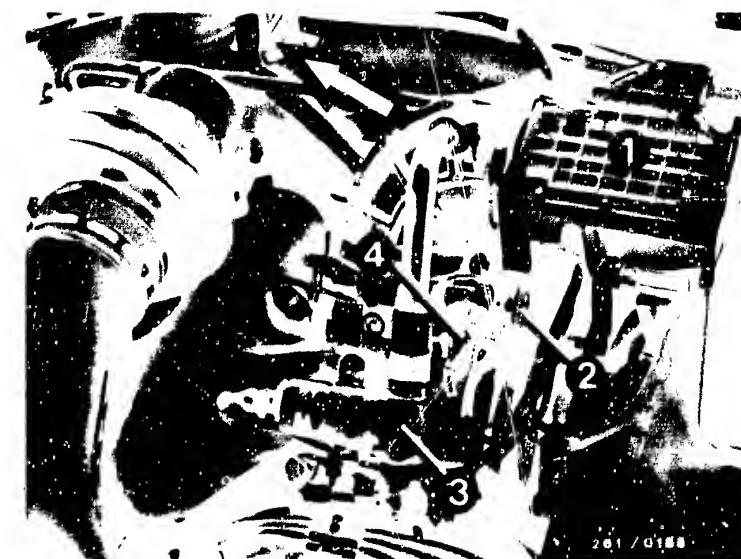


Test step 6			
Operation		Reading	Testing
Program switch position "V"	↓	Reading is temperature -dependent, i.e. note engine temperature. At ambient temper- ature (+15°...+30° C): 1.45...3.3 kΩ With engine at normal operating temperature (approx. + 80° C): 280...360Ω	<u>Component:</u> Air temperature sensor (NTC I)
Program switch position "5"	6		
Measuring equipment: Ohmmeter			<u>Operation:</u> Resistance between Term. 22 and ground
Measuring range: 0 to 10 kΩ			
Connection: Test sockets	Ω	yes ↓ Continue testing with next test step.	<u>Malfunction:</u> Resistance outside tolerance. Note temperature.
Operation in vehicle: Switch off ignition		no ↓	

Trouble-shooting:

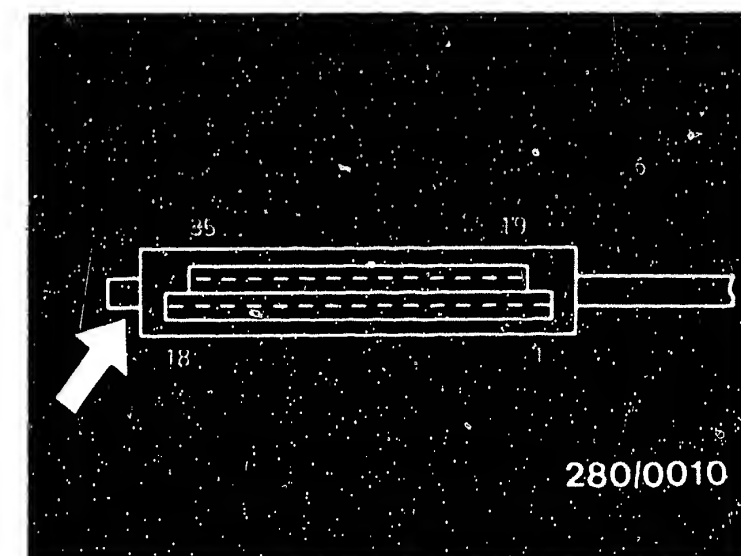
- Remove plug from air-flow sensor and measure resistance directly at Term.22 (1)* and Term.6(4)*.If reading outside tolerance, replace air-flow sensor.
- Check leads from air-flow sensor Term. 6 (4)* and Term. 22 (1)* to multiple plug Term. 6 and Term. 22.
- Eliminate contact resistances in the plug-in connections.
Spring contacts must not allow themselves to be pushed back.

(*) = New identification markings on the air-flow sensor.



- 1 = Air-flow sensor
2 = Throttle valve switch
3 = Idle actuator

Top view of plug on 35-pole multiple
of Motronic wiring harness
Arrow = Lug with mechanical cooling



D9

Testing with universal test adapter
Porsche 911 Carrera



D10

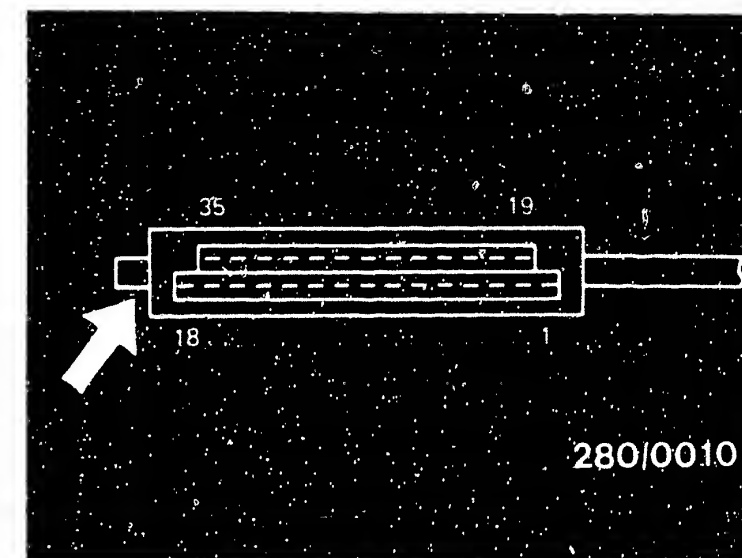
Testing with universal test adapter
Porsche 911 Carrera



Test step 7 (For California and Japan models only)			
Operation		Reading	Testing
Program switch position "V"	↓	less than 10 Ω	Component: Lead
Program switch position "5"	7		
Measuring equipment: Ohmmeter		<div>yes</div> <div>Continue testing with test step 9</div> <div>(Test step 8 is not used)</div>	Operation: No connection between Term. 10 and ground
Measuring range: 0 to 10 k Ω			
Connection: Test sockets	Ω		Malfunction: Resistance value greater than 10 Ω
Operation in vehicle: Switch off ignition		no	

Trouble-shooting:

- Cut connection between multiple plug Term. 10 and ground.



Top view of 35-pin multiple plug of Motronic wiring harness

D11

Testing with universal test adapter
Porsche 911 Carrera



D12

Testing with universal test adapter
Porsche 911 Carrera



Test step 8 deleted

Test step 9

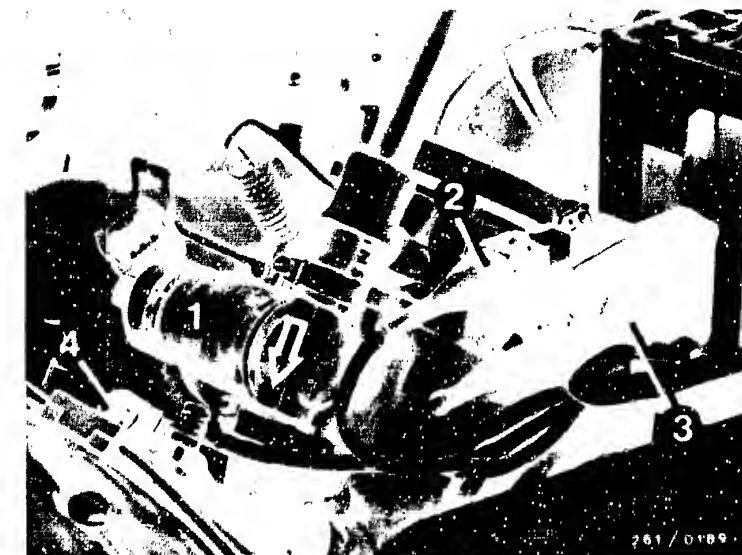
Operation		Reading	Testing
<u>Program switch position</u> "V"	↓	<u>Accelerator in rest position:</u> <u>Less than 10 Ω</u>	<u>Component:</u> Microswitch
<u>Program switch position</u> "II"	9	(Measured value is influenced by protective resistor in adapter).	
<u>Measuring equipment:</u> Ohmmeter		<u>Accelerator depressed</u> (Part-load range): <u>∞ Ω</u> 1)	<u>Operation:</u> Idle contact between terminal 2 and ground
<u>Measuring range:</u> 0 to 10 kΩ			
<u>Connection:</u> Test sockets	Ω	yes ↓	<u>Malfunction:</u> Resistance in rest position greater than 10 Ω or less than ∞ Ω.
<u>Operation in vehicle:</u> Switch off ignition		<u>Continue testing with next test step.</u> ↓	

Trouble-shooting:

1) Instructions:

The idle contact must switch over before the throttle valve opens.

Design actions described below cause an idle travel of approx. 1 mm, in which the microswitch switches over.



- 1 = Idle actuator
- 2 = Plug from microswitch (idle contact)
- 3 = Throttle valve switch (full load contact only)

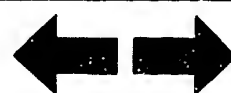
- 1 = Microswitch (idle contact)
- 2 = Drag lever



Continued on D15/D16

D 13

Testing with universal test adapter
Porsche 911 Carrera



D 14

Testing with universal test adapter
Porsche 911 Carrera



Trouble-shooting, test step 9 (continued)

Microswitch (idle contact)

The idle contact supplies a signal for the overrun cutoff and the idle speed control.

The microswitch is activated using a drag lever that is connected to the accelerator linkage.

This drag lever is mounted on the throttle valve shaft so that it can turn, and it carries the throttle valve lever along with it.

The accelerator linkage bearing pin extends into a hole on the throttle valve lever that is approx. 1 mm larger than the pin.

That produces an idle travel so that the idle contact opens before the throttle valve.

When the throttle valve is closed, a torsion spring presses the drag lever against the throttle valve lever and thereby closes the idle contact.

Checking the adjustment of the microswitch

Slowly activate the accelerator linkage, approx. 1 mm. The microswitch must switch over within the idle travel.

When this is done, the reading jumps from 0Ω to $\infty \Omega$.

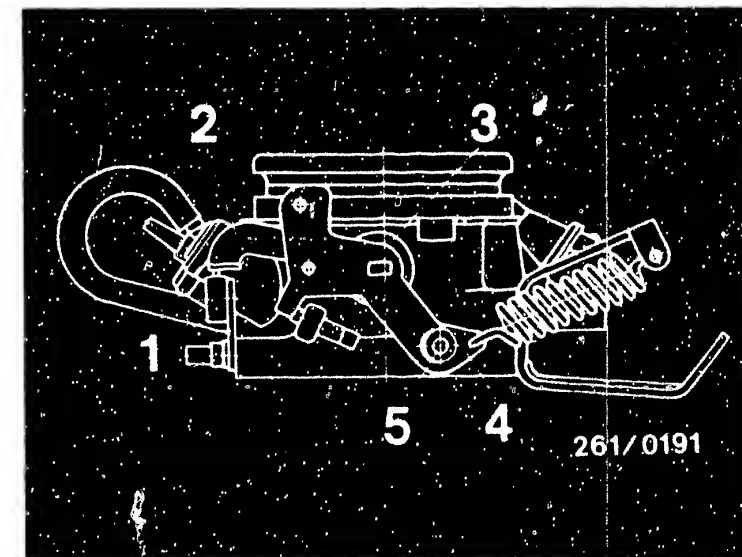
If need be, adjust the microswitch appropriately.

If the mechanical setting is O.K., then the microswitch, its plug connections, and the leads must be checked for a break and for contact resistance.

Adjustment of the accelerator linkage

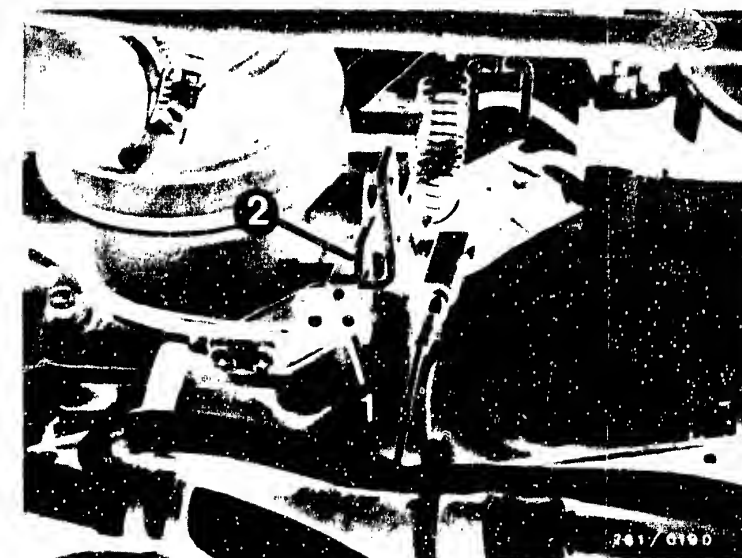
The clearance on the long accelerator rod must be 0.5 ... 1 mm at the gear-shift lever, since otherwise the idle contact does not always switch over.

To check, press the lower lever lightly toward the rear of the vehicle.



- 1 = Microswitch
- 2 = Drag lever
- 3 = Torsion spring
- 4 = Throttle valve lever
- 5 = Accelerator linkage-bearing pin

- 1 = Microswitch (idle contact)
- 2 = Drag lever



D 15


Testing with universal test adapter
Porsche 911 Carrera

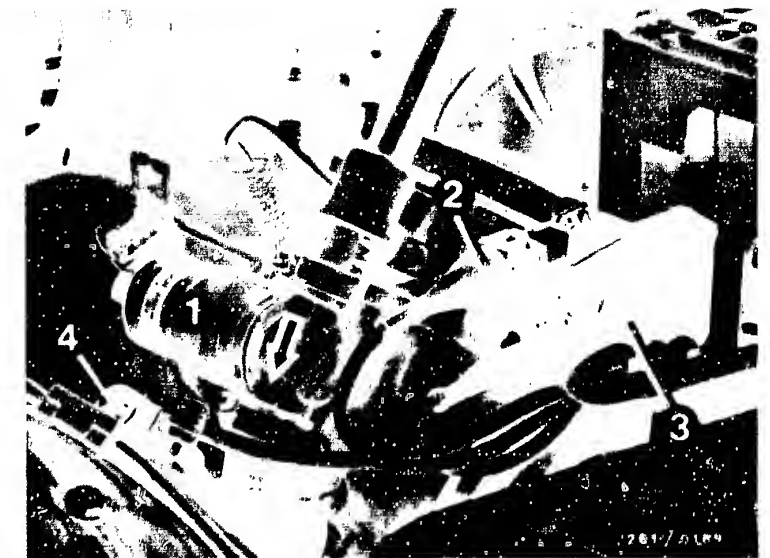


D 16

Testing with universal test adapter
Porsche 911 Carrera



Test step 10			
Operation		Reading	Testing
Program switch position "V"		Accelerator in part-load position: $\infty \Omega$	Component: Throttle-valve switch (contains only full-load-load contact)
Program switch position "II"	10	Accelerator at full-load stop: Less than 10Ω ¹⁾ (Measured value is influenced by protective resistor in adapter)	Operation: Full-load contact between terminal 3 and ground
Measuring equipment: Ohmmeter		<div>yes</div> <div>↓</div>	<div>no</div> <div>↓</div>
Measuring range: 0 to 10 k Ω			
Connection: Test sockets	Ω	Continue testing with next test step.	Malfunction: Resistance at full load greater than 10 Ω or $\infty\Omega$.
Operation in vehicle: Switch off ignition			



- 1 = Idle actuator
 2 = Plug connection for microswitch (idle contact)
 3 = Throttle valve switch (only full-load contact)
 4 = Plug-in connection to tachometer

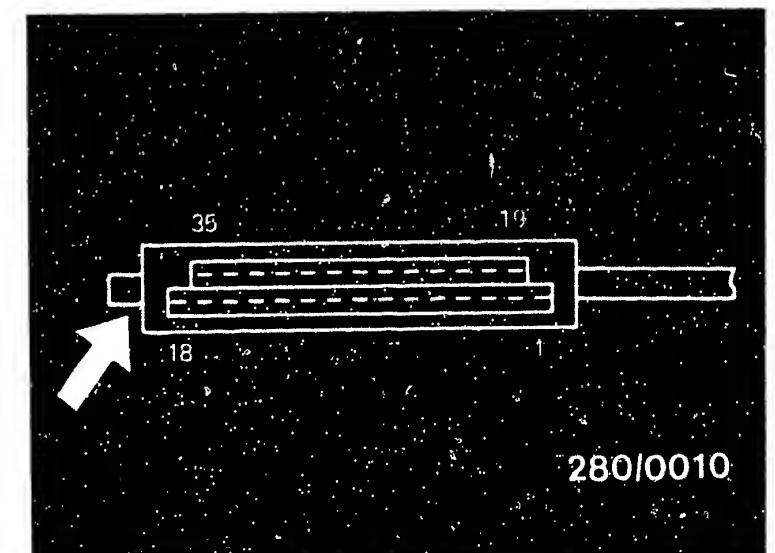
Top view of 35-pin multiple plug of Motronic wiring harness K1.1 (Term. 1) = Plug-in connection to tachometer

Trouble-shooting:

- 1) Inspection: Activate the throttle valve in the direction of full load. The reading shortly before the full-load stop of the activation lever goes to a value less than 10Ω (full-load contact closed).
 If need be, adjust the throttle valve switch.

Reading greater than 10Ω or $\infty\Omega$:

Check whether or not the throttle valve is completely open. Check the accelerator linkage from the gas pedal to the throttle valve for freedom of movement. If need be, grease the ball-joint. Do not grease the bearing on the throttle valve lever.
 Recheck the BOSCH throttle valve switch and the lead from the throttle valve switch Term. 3 to the multiple plug Term. 3. Eliminate contact resistances. It must not be possible to shove back the spring contact!



D17


Testing with universal test adapter
 Porsche 911 Carrera



D18

Testing with universal test adapter
 Porsche 911 Carrera



Test step 11			
Operation		Reading	Testing
Program switch position <u>"V"</u>		Less than 10Ω (Measured value is influenced by protective resistor in adapter)	Component: Ground lead
Program switch position <u>"I"</u>	11		
Measuring equipment:		<div><div>yes</div><div>no</div></div>	Operation: Contact resistance between Term. 16 and ground
Ohmmeter			
Measuring range:			Malfunction: Resistance greater than 10Ω
0 to 10 kΩ			
Connection:	Ω		
Test sockets			
Operation in vehicle:			
Switch off ignition		Continue testing with next test step.	

Trouble-shooting:

For testing, remove wiring-harness plug from test adapter and, if necessary, use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0Ω):

- From multiple plug Term. 16 to ground
- From multiple plug Term. 5 to ground

Eliminate contact resistances at connection points.

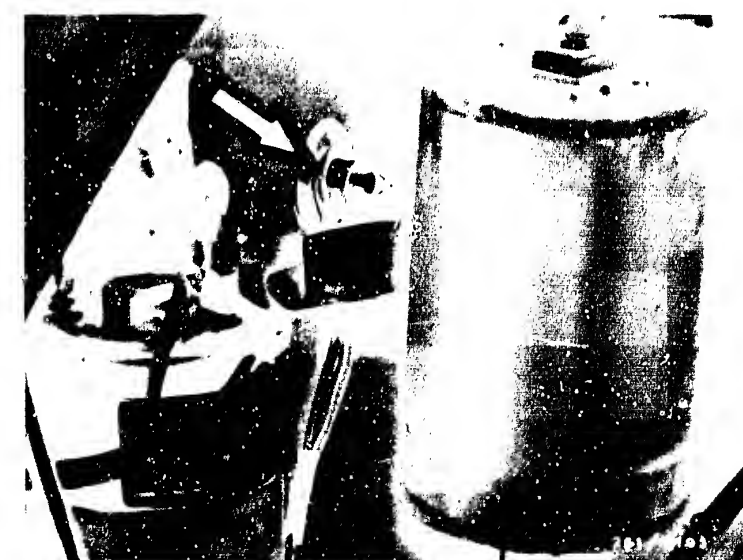
Spring contacts must not allow themselves to be pushed back.

Check grounding strip between vehicle body and engine.



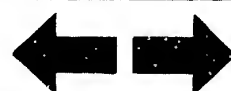
Arrow = Ground terminal on intake manifold, Cyl. 1

Arrow = Ground connection on the mounting for the fuel filter



D19

Testing with universal test adapter
Porsche 911 Carrera

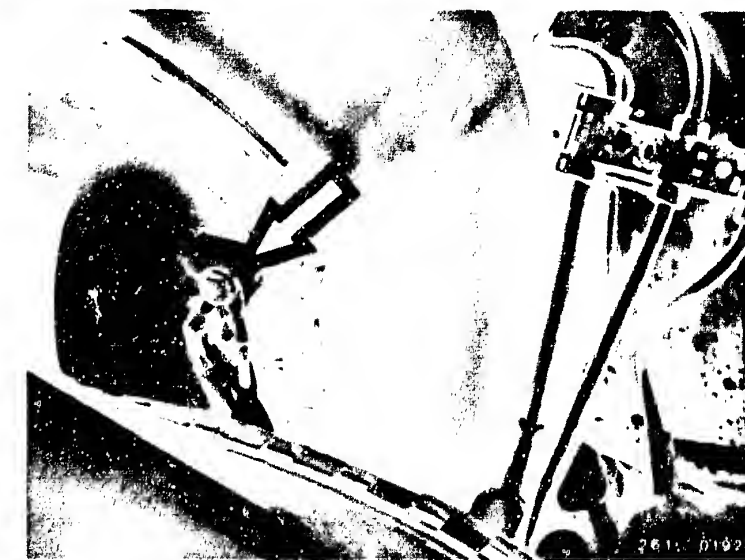


D20

Testing with universal test adapter
Porsche 911 Carrera

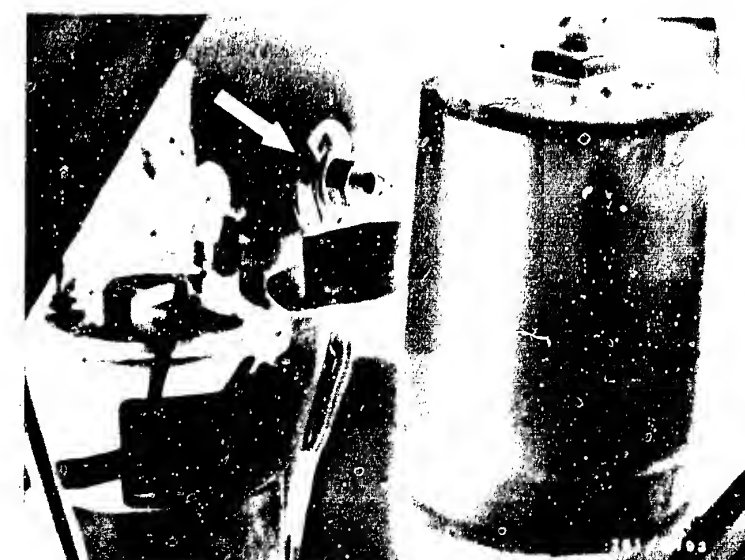


Test step 12			
Operation		Reading	Testing
Program switch position "V"		Less than 10Ω (Measured value is influenced by protective resistor in adapter)	Component: Ground lead
Program switch position "Ω"			Operation: Contact resistance between Term. 17 and ground
12			
Measuring equipment:		<div><div>yes</div><div>no</div></div>	Malfunction: Resistance greater than 10Ω
Ohmmeter			
Measuring range:			Continue testing with next test step.
0 to 10 kΩ			
Connection:			
Test sockets			
Operation in vehicle:			
Switch off ignition			



Arrow = Ground terminal on intake manifold, Cyl. 1

Arrow = Ground connection on the mounting for the fuel filter



Trouble-shooting:

For testing, remove wiring-harness plug from test adapter and, if necessary, use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0Ω):

- From multiple plug Term. 17 to ground
- From multiple plug Term. 5 to ground

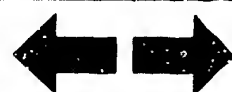
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.

Check grounding strip between vehicle body and engine.

D21

Testing with universal test adapter
Porsche 911 Carrera



D22

Testing with universal test adapter
Porsche 911 Carrera



Test step 13				
Operation		Reading	Testing	
Program switch position "V"	↓	Less than 10 Ω (Measured value is influenced by protective resistor in adapter)	Component: Ground lead	
Program switch position "Ω"	13		Operation: Contact resistance between Term. 19 and ground	
Measuring equipment: Ohmmeter			Malfunction: Resistance greater than 10 Ω	
Measuring range: 0 to 10 k Ω		yes ↓		
Connection: Test sockets	Ω	Continue testing with test step 15		
Operation in vehicle Switch off ignition		(Test step 14 is not used)		
		no ↓		

Trouble-shooting

For testing, remove wiring-harness plug from adapter and, if necessary, use circuit diagram.

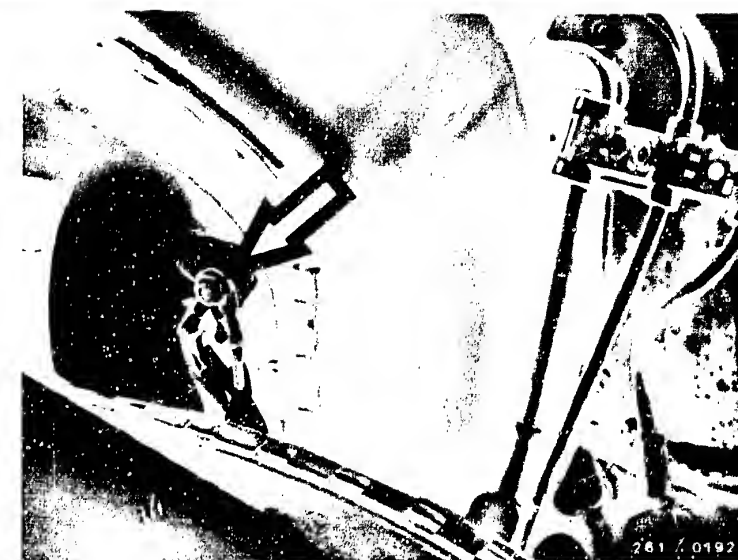
Test the following leads for continuity using ohmmeter (set value approx. 0 Ω)

- From multiple plug Term. 19 to ground
- From multiple plug Term. 5 to ground

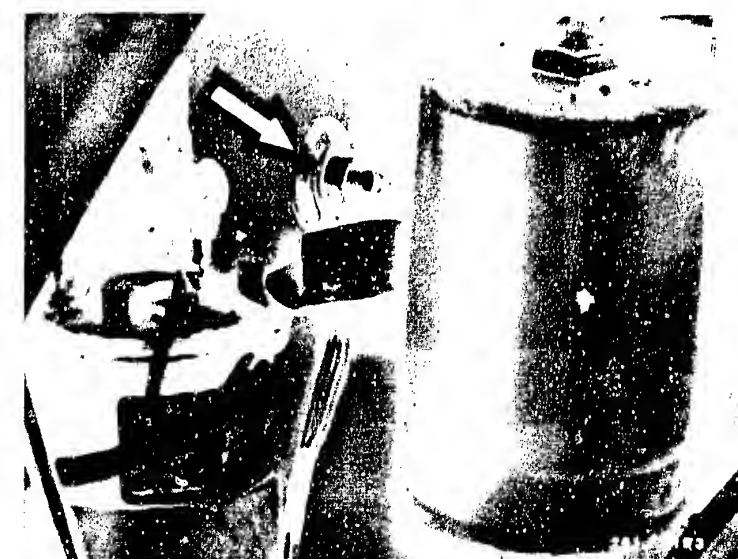
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.

Check grounding strip between vehicle body and engine.



Arrow = Ground terminal on intake manifold, Cyl. 1



Arrow = Ground connection on the mounting for the fuel filter

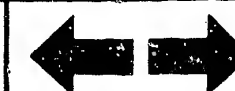
D23

Testing with universal test adapter
Porsche 911 Carrera



D24

Testing with universal test adapter
Porsche 911 Carrera



Test step 14 deleted

Test step 15			
Operation		Reading	Testing
Program switch position "V"		The contact is closed at elevation <u>above</u> 1000 m: <u>less than 10 Ω</u> The contact is open at elevations <u>less than</u> 1000 m: <u>∞ Ω</u>	Component: Altitude sensor
Program switch position "Ω"			
15		<div><div>yes</div><div>no</div></div> <div>Continue testing with next test step.</div>	Operation: Dependance of contact Term. 28 on elevation
Measuring equipment:			
Ohmmeter			
Measuring range:			
0 to 10 kΩ		<div><div>yes</div><div>no</div></div> <div>Continue testing with next test step.</div>	Malfunction: Resistance value greater than 10 Ω or smaller than ∞ Ω.
Connection:			
Test sockets			
Ω			
Operation in vehicle:		Continue testing with next test step.	
Switch off ignition			

Trouble-shooting:

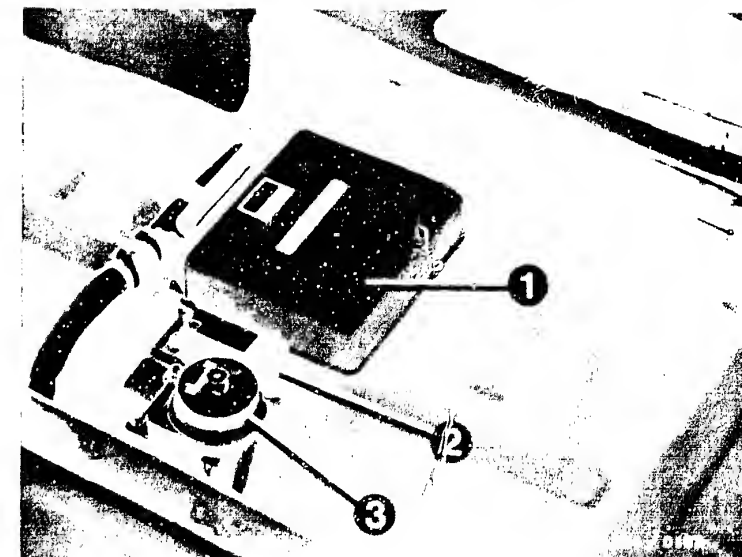
For testing, remove wiring-harness plug from test adapter and, if necessary, use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

- From multiple plug Term. 28 to the altitude sensor.
- From ground to the altitude sensor.

Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.



- 1 = Control unit
- 2 = Main and pump relays
- 3 = Altitude sensor (only USA)

E1



Testing with universal test adapter
Porsche 911 Carrera

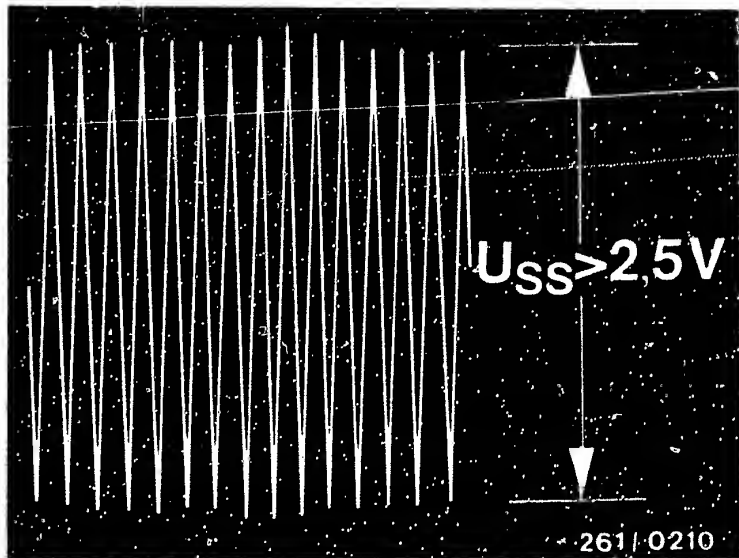


E2

Testing with universal test adapter
Porsche 911 Carrera

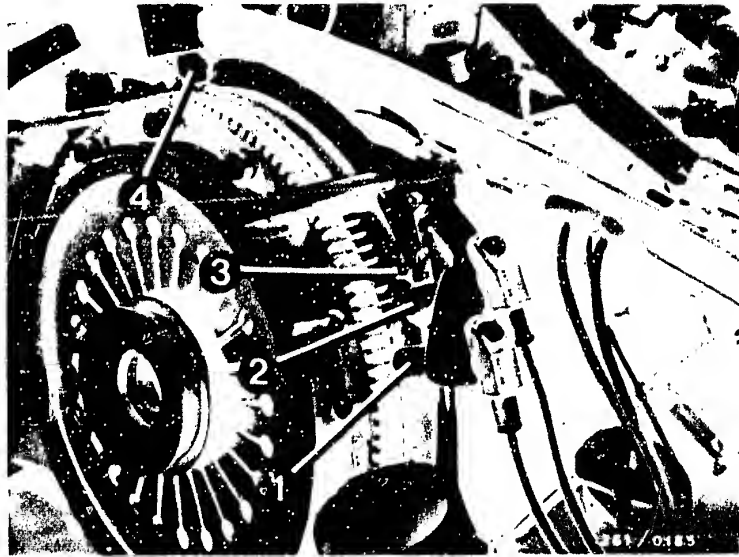


Test step 16				
Operation		Reading	Testing	
<u>Program switch position</u> 	1	For rotational speed sensor signal, see figure.	<u>Component:</u> Engine-speed sensor	
<u>Program switch position</u> 	15			
<u>Measuring equipment:</u> Motortester, oscilloscope		<div><div></div><div>yes</div><div></div></div>	<u>Operation:</u> Amplitude (signal) at terminals 8 and 27	
<u>Measuring range:</u> Special input				
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			<div><div></div><div>no</div><div></div></div>	<u>Malfunction:</u> No signal or signal too small. Incorrect signal
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor				
		<u>Continue testing with next test step.</u>		



Rotational speed sensor signal

- 1 = Rotational speed sensor
- 2 = Reference mark sensor
- 3 = Reference mark pin
- 4 = Position sensor



Trouble-shooting:

No signal or signal too small:

- Cranking speed below 200 min^{-1} ; charge battery.
- The air gap (nominal dimension 0.8 mm) can be measured directly with a feeler gauge only with the engine removed. Slide 0.8 mm feeler gauge between ring gear and engine-speed sensor.
However, the sensor mounting is not adjustable.

Continued on E5/E6

E3

Testing with universal test adapter
Porsche 911 Carrera



E4

Testing with universal test adapter
Porsche 911 Carrera



Trouble-shooting, test step 16 (continued)

Check the air gap with the engine installed as follows:

Take out the rotational speed sensor and using a depth gauge, measure the length of the sensor. Hold the scale firmly.
Using the depth gauge, measure the depth of the hole in the mounting down to the head of the tooth. Do not measure into the tooth gap!
The allowable difference between the two dimensions (depth of hole minus the length of the sensor) is max. 0.8 mm.

• Taking out and replacing the sensors

For taking out and replacing the sensors, take apart the plug connection. To remove the plug connector in the mounting, release the mechanical lock with a screwdriver and pull the plug connector out in a downward direction.

Unscrew the socket hex screw on the sensor. Clean off any dirt deposit on the sensor. If need be, insert two screwdrivers into the recesses on the left and right of the sensor and lift the sensor.

N.B.! Do not release the mounting!

Before putting the sensors in, make certain that no metallic parts are clinging to the sensor (the sensors contain permanent magnets).

Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors for one another when putting them in!
The rotational speed sensor is located in front of the reference mark sensor, looking in the direction of forward vehicle travel.

Watch the identification marking:

- Reference mark sensor with identification marking BG on the leads.
- Rotational speed sensor with identification marking DG on the leads.

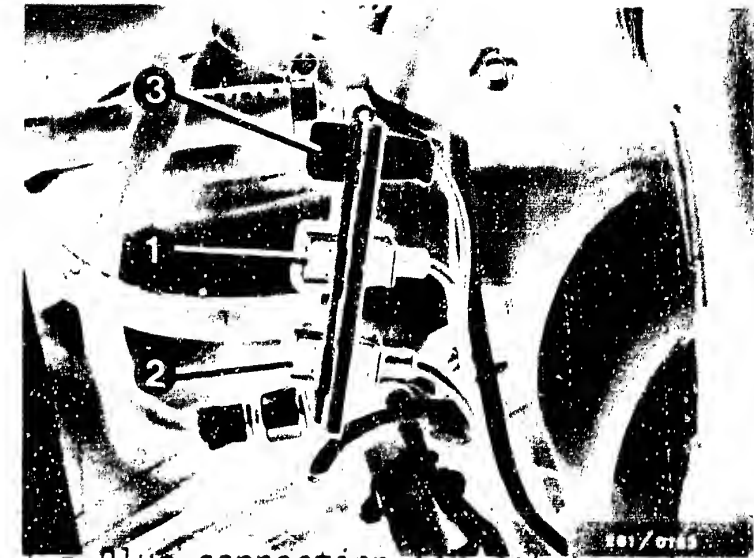
The sensors are stuck into the hole until they reach the stop and screwed in tight.

Do not use any force when inserting.

When mounting, make certain that the couplings are properly assigned and catch!

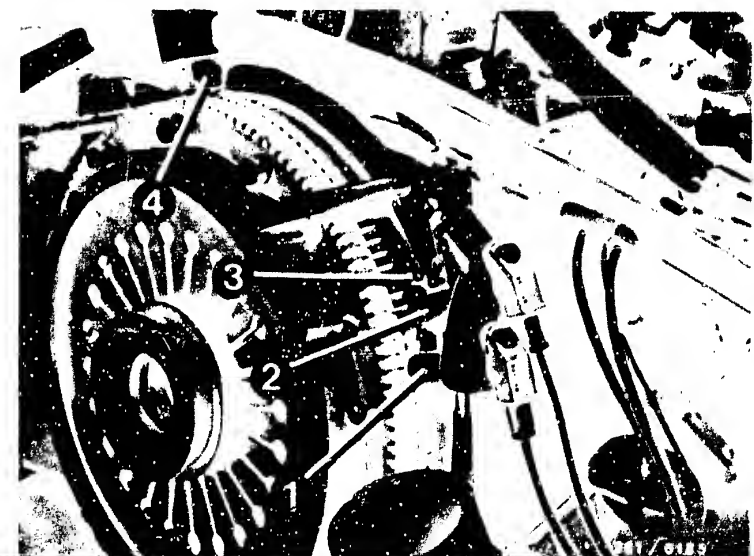
Make certain that the spring contacts in the plug are properly seated and catch!

It must not be possible to shove the spring contact back.



- 1 = Plug connection for rotational speed sensor with identification DG
- 2 = Plug for reference mark sensor with identification BG
- 3 = Plug connection for temperature sensor II (engine)

- 1 = Rotational speed sensor
- 2 = Reference mark sensor
- 3 = Reference mark pin
- 4 = Position sensor



E5

Testing with universal test adapter
Porsche 911 Carrera



E6

Testing with universal test adapter
Porsche 911 Carrera



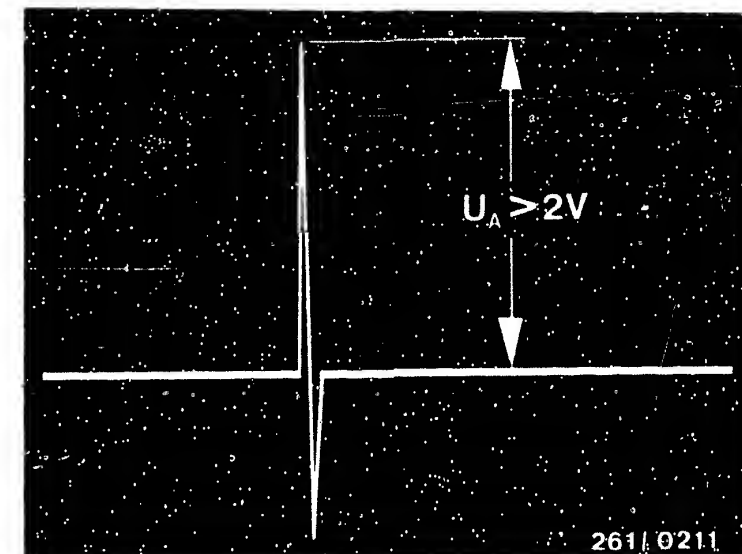
Test step 17		Reading	Testing
Operation			
Program switch position "V"	2	Reference mark sensor signal (see figure)	Component: Reference-mark sensor
Program switch position "Ω"			
Measuring equipment: Motortester, oscilloscope		Automatic and manually -shifted transmission Lever to left-hand stop (calibrated voltage range)	Operation: Amplitude (signal) at terminals 25 and 26
Measuring range:			
Special input		yes ↓ Continue testing with test step 19 (Test step 18 is not used)	Malfunction: No signal or signal too small. Incorrect signal.
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and operate starting motor		no ↓	

Trouble-shooting:

- No signal or signal too small: -1
- Cranking speed below 200 min⁻¹ → charge battery.
 - The nominal air gap is 0.8 mm.

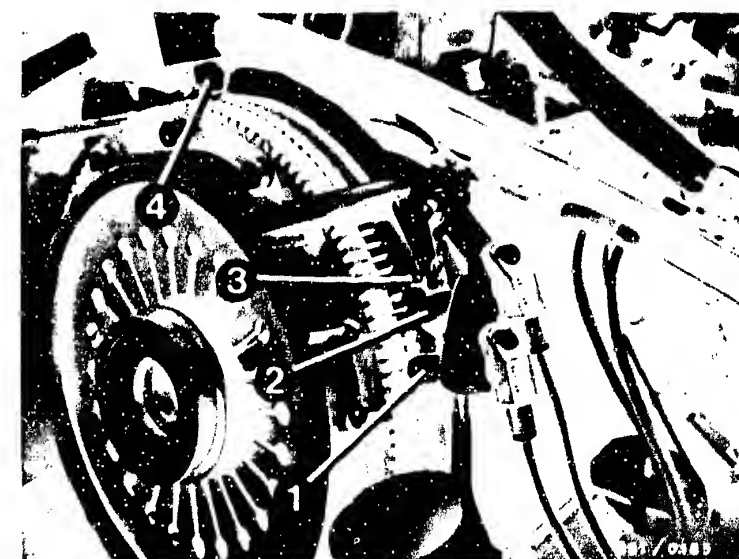
The air gap of the reference-mark sensor need only be checked if the reference-mark screw which is bonded into the flywheel is damaged or replaced.
Have repairs carried out in Porsche workshop.

Continued on E9/E10



Rotational speed sensor signal

- 1 = Rotational speed sensor
- 2 = Reference mark sensor
- 3 = Reference mark pin
- 4 = Position sensor



E7

Testing with universal test adapter
Porsche 911 Carrera



E8

Testing with universal test adapter
Porsche 911 Carrera



Trouble-shooting, test step 17 (continued)

- **Faulty signal:**

Incorrect, if negative peak comes first.

Check the assignment of the leads against the circuit diagram and the figure at the right.

- **Taking out and replacing the sensors**

For taking out and replacing the sensors, take apart the plug connection. To remove the plug connector in the mounting, release the mechanical lock with a screwdriver and pull the plug connector out in a downward direction.

Unscrew the socket hex screw on the sensor. Clean off any dirt deposit on the sensor. If need be, insert two screwdrivers into the recesses on the left and right of the sensor and lift the sensor.

N.B.! Do not release the mounting!

Before putting the sensors in, make certain that no metallic parts are clinging to the sensor (the sensors contain permanent magnets). Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors for one another when putting them in!

The rotational speed sensor is located in front of the reference mark sensor, looking in the direction of forward vehicle travel.

Watch the identification marking:

- Reference mark sensor with identification marking BG on the leads.
- Rotational speed sensor with identification marking DG on the leads.

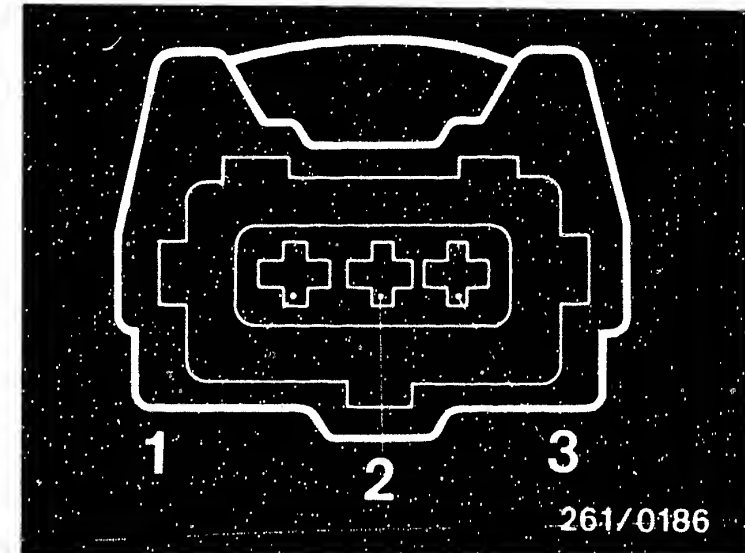
The sensors are stuck into the hole until they reach the stop and screwed in tight.

Do not use any force when inserting.

When mounting, make certain that the couplings are properly assigned and catch!

Make certain that the spring contacts in the plug are properly seated and catch!

It must not be possible to shove the spring contact back.



Top view of the plug for sensors

- 3 = DG → Term. 23, BG → Term. 5
2 = DG → Term. 27, BG → Term. 26
1 = DG → Term. 8, BG → Term. 25

- 1 = Plug connection for rotational speed sensor with identification DG
2 = Plug for reference mark sensor with identification BG
3 = Plug connection for temperature sensor II (engine)



E9

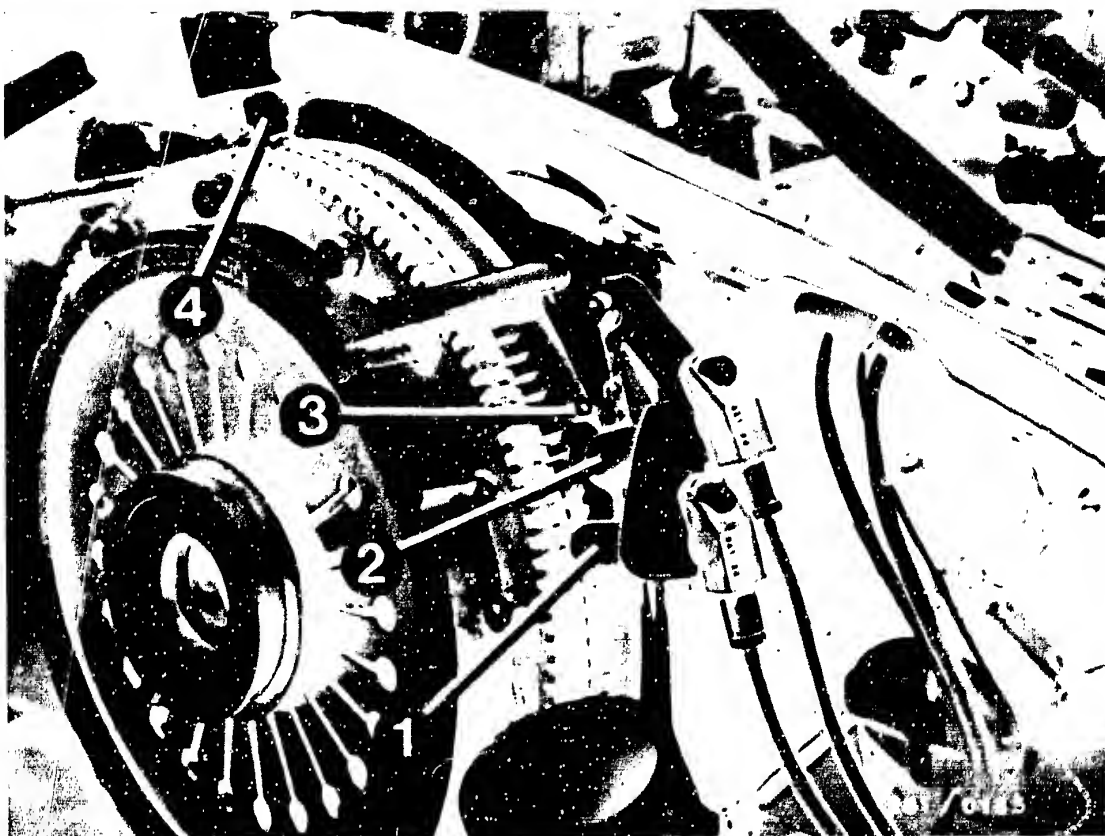
Testing with universal test adapter
Porsche 911 Carrera



E10

Testing with universal test adapter
Porsche 911 Carrera



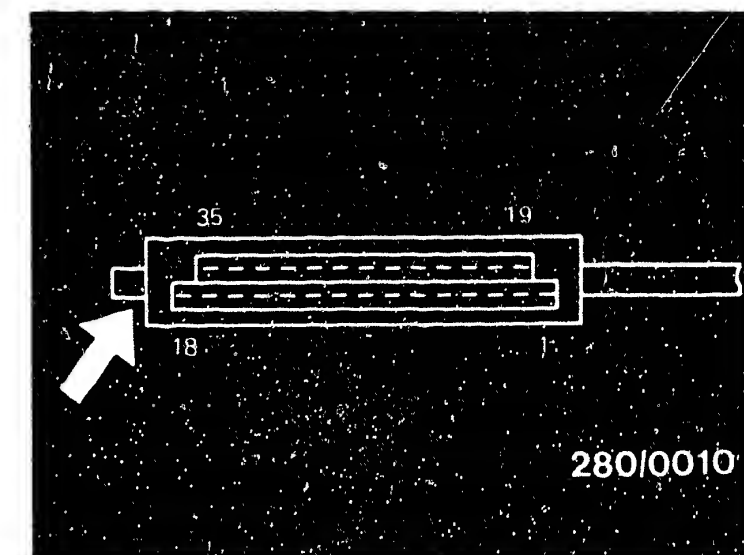


Trouble-shooting test step 17 (continued)

1 = Rotational speed sensor
2 = Reference mark sensor

3 = Reference mark pin
4 = Position sensor

Test step 19, if there is an air conditioner. Test step 18 is not used.			
Operation		Reading	Testing
Program switch position "V"	4	Switch on the air conditioner (compressor must work) greater than 8 V	<u>Components:</u> Lead to the air conditioner
Program switch position "Ω"	15		
<u>Measuring equipment:</u> Voltmeter <u>Measuring range:</u> 15 V			<u>Operation:</u> Voltage after switching on the air conditioner. Term. 29 to Term. 5.
Connection: Test sockets, (red = +, black = ground)	V	<div>yes</div> <div>no</div>	<u>Malfunction:</u> Voltage less than 8 V.
<u>Operation in vehicle:</u> Switch on ignition		Continue testing with next test step.	



Top view of plug on 35-pole multiple of Motronic wiring harness
 Arrow = Lug with mechanical cooling

Trouble-shooting:

- Check the lead from the multiple plug Term. 29 to the switch on the air conditioner.
- Check the plug connections for corrosion, catching, and break in lead.

E12

Testing with universal test adapter
 Porsche 911 Carrera



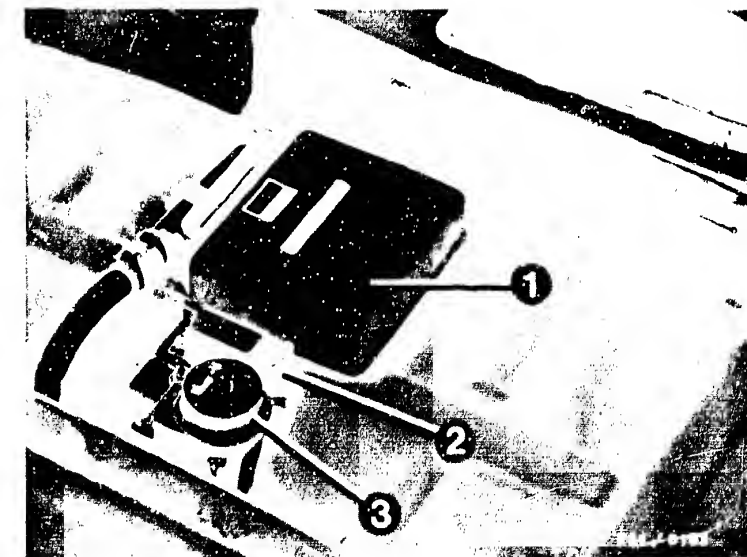
E13

Testing with universal test adapter
 Porsche 911 Carrera



Test step 20 Ignition off. Connect control unit and pump fuse.

Operation		Reading	Testing
Program switch position "V"	6	10 ... 15 V	<u>Components:</u> Relay (main relay) set
Program switch position "Ω"			
Measuring equipment:	15	yes no	<u>Operation:</u> Supply voltage for control unit at terminals 35 (+) and 5 (ground)
Voltmeter			
Measuring range:	V	Continue testing with next test step.	<u>Malfunction:</u> Voltage less than 10 V
15 V			
Connection: Test sockets, (red = +, black = ground)			
Operation in vehicle:			
Switch on ignition			



- 1 = Control unit
- 2 = Main and pump relays
- 3 = Altitude sensor (only USA)

Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged or high voltage drops at terminals.

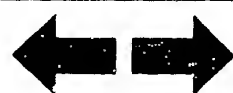
2. No voltage reading: Check relay set.

Perform the following voltage measurements at the relay with the ignition on:

- Measure battery voltage at Term. 87, Term. 86 and Term. 30.
Measure ground connection Term. 85 to B+ (test adapter connected).
- Check the lead from the relay set Term. 87 to the multiple plug Term. 35.
- Check Motronic ground terminal.

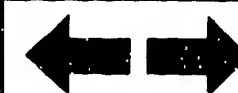
E14

Testing with universal test adapter
Porsche 911 Carrera

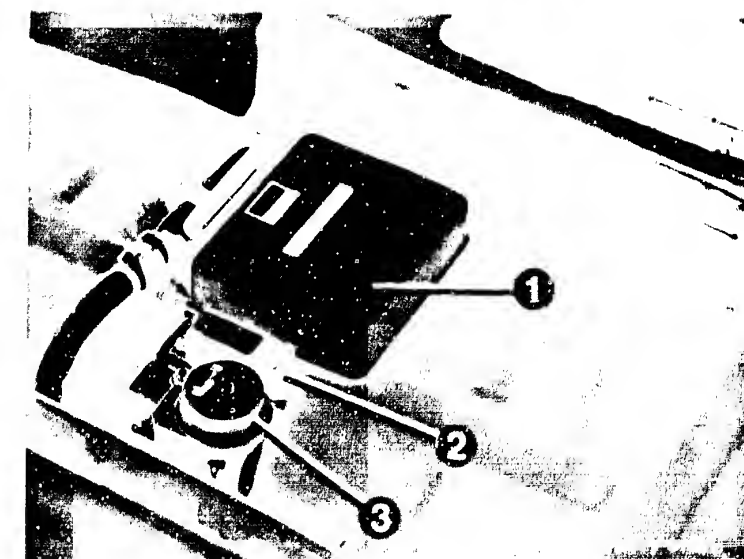


E15

Testing with universal test adapter
Porsche 911 Carrera



Test step 21							
Operation		Reading		Testing			
Program switch position "V"	7	10 ... 15 V		<u>Components:</u> Relay (main relay) set			
Program switch position "Ω"	15						
<u>Measuring equipment:</u> Voltmeter		yes ↓	no ↓	<u>Operation:</u> Supply voltage for control unit at terminals 18 (+) and 5 (ground)			
<u>Measuring range:</u> 15 V							
Connection: Test sockets, (red = +, black = ground)	V			<u>Malfunction:</u> Voltage less than 10 V			
<u>Operation in vehicle:</u> Switch on ignition							
		Continue testing with next test step.					



- 1 = Control unit
 2 = Main and pump relays
 3 = Altitude sensor (only USA)

Trouble-shooting:

- Check the lead from the multiple plug Term. 18 to the relay set Term. 87.

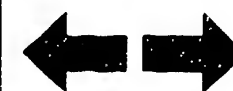
E16

Testing with universal test adapter
Porsche 911 Carrera



E17

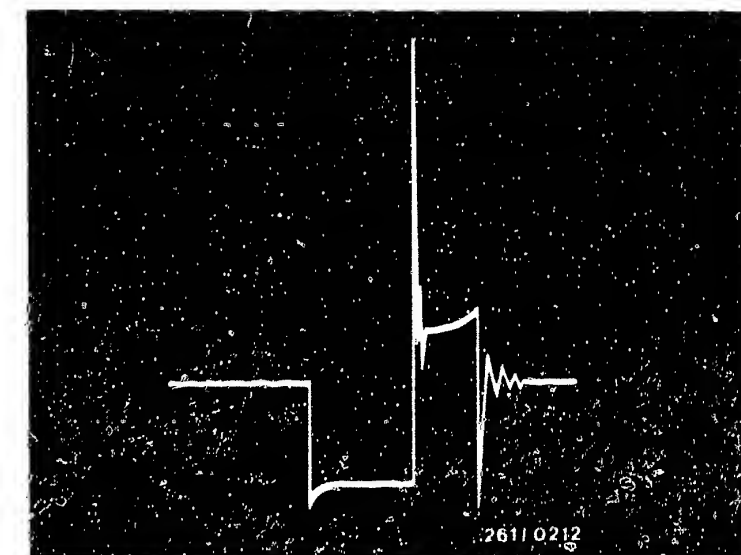
Testing with universal test adapter
Porsche 911 Carrera



Test step 22		
Operation	Reading	Testing
Program switch position "V"	5	Primary signal present (see figure at top)
Program switch position "Ω"		
Measuring equipment: Motortester, oscilloscope	15	Component: Ignition coil, H.T. ignition cables, control unit
Measuring range: Special input		
Connection: Test wells; red clip to red well, black clip to black well, triggering on cylinder 1	yes	Operation: Primary signal from ignition coil terminal 1 to ground
Operation in vehicle: Shift gear to neutral and operate starting motor		
	no	Malfunction: No signal or incorrect signal.
	Continue testing with next test step.	

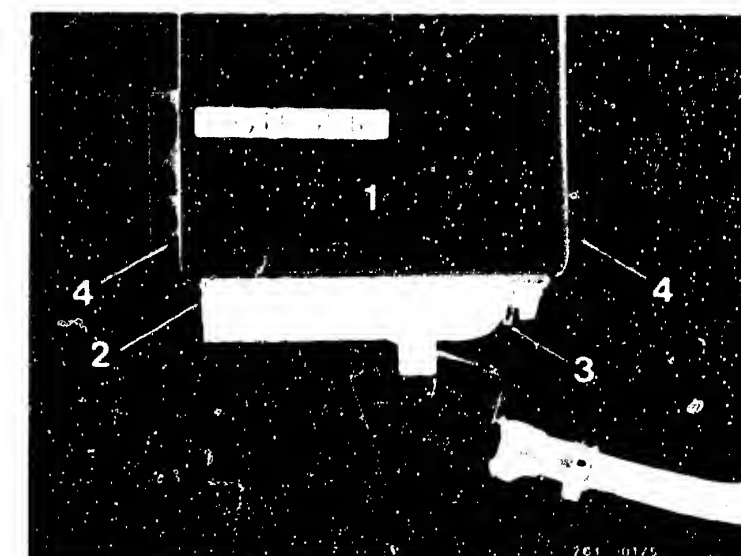
Trouble-shooting:

- Check Motronic - ground terminals:
The terminal points must be bare metal and the screws must be tightened firmly.
- Check the ignition coil, including the leads and the high voltage leads.
It must not be possible to shove back the spring contact on the multiple plug Term. 1.
- Check the lead from ignition coil Term. 15 to the ignition lock Term. 15.
- Take out and replace the control unit.



Primary signal

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting hole



E18

Testing with universal test adapter
Porsche 911 Carrera



E19

Testing with universal test adapter
Porsche 911 Carrera



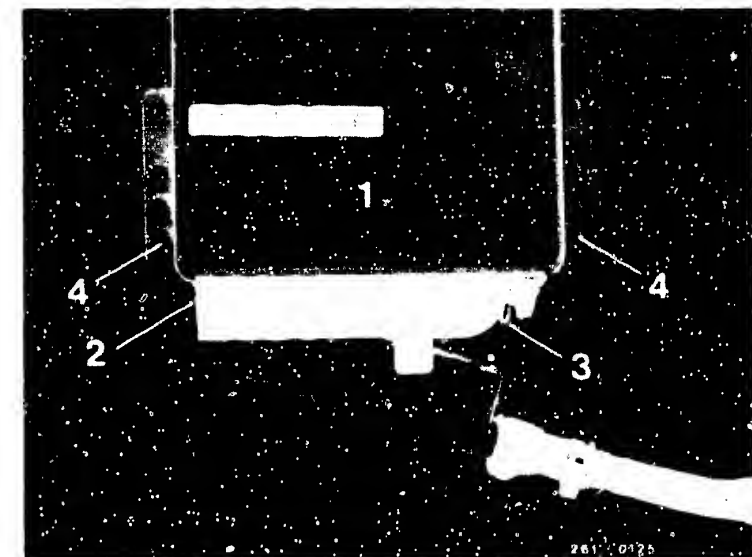
Test step 23			
Operation		Reading	Testing
Program switch position "V"	8	grater than approx. 5V	<u>Component:</u> Control unit
Program switch position "Ω"	15		
<u>Measuring equipment:</u> Voltmeter		<div><div></div><div>yes</div><div>Continue testing with next test step.</div></div> <div><div></div><div>no</div><div></div></div>	<u>Operation:</u> Supply voltage for air-flow sensor at terminal 9 and ground.
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Test sockets, (red = +, black = Ground)	V		
<u>Operation in vehicle:</u> Switch on ignition			
			<u>Malfunction:</u> Voltage less than 5 V

Trouble-shooting:

- Replace control unit

Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

E20

Testing with universal test adapter
Porsche 911 Carrera



E21

Testing with universal test adapter
Porsche 911 Carrera



Test step 24		
Operation	Reading	Testing
Program switch position "V" 9	<u>220...280 mV</u> with air-flow sensor flap closed. Remove hose from air-flow sensor on air filter side and open sensor flap by hand. Sensor flap must not catch and must return automatically to its rest position when released. With the sensor flap fully open the reading rises to above 4,5 V (change to different measuring range).	<u>Component:</u> Air-flow sensor
Program switch position "Ω" 15		
Measuring equipment: Voltmeter		<u>Operation:</u> Divider voltage at terminal 7 and ground
Measuring range 1.5 V		
Connection: Test sockets (red = +, black = ground) V	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue testing with test step 27 (test steps 25 and 26 are not used) </div> <div style="text-align: center;"> no ↓ </div> </div>	<u>Malfunction:</u> No voltage or voltage too low
Operation in vehicle: Switch on ignition		

Trouble-shooting:

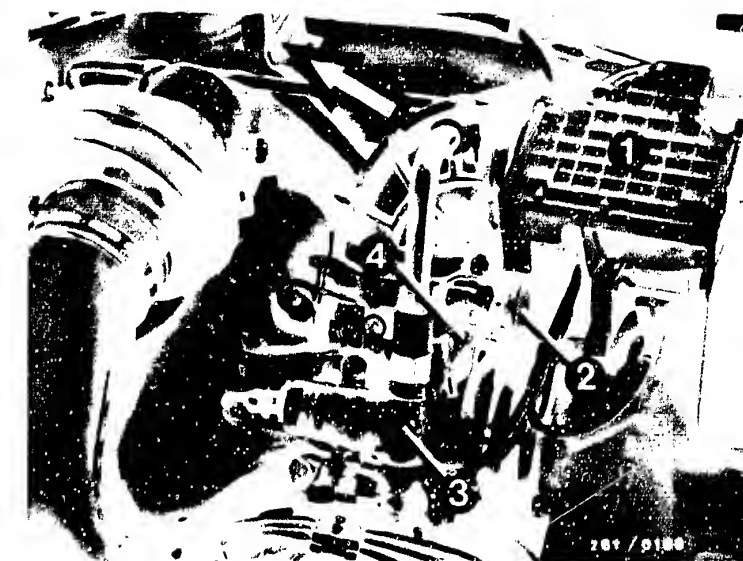
No reading:

- Check leads from the air-flow sensor Term. 6(4)*, 7(2)*, and 9(3)* to the multiple plug Term. 6, 7, and 9.
- Spring contact must not allow themselves to be pushed back.

Reading outside tolerance:

- Check whether air-flow sensor flap is closing fully.
- Replace air-flow sensor.

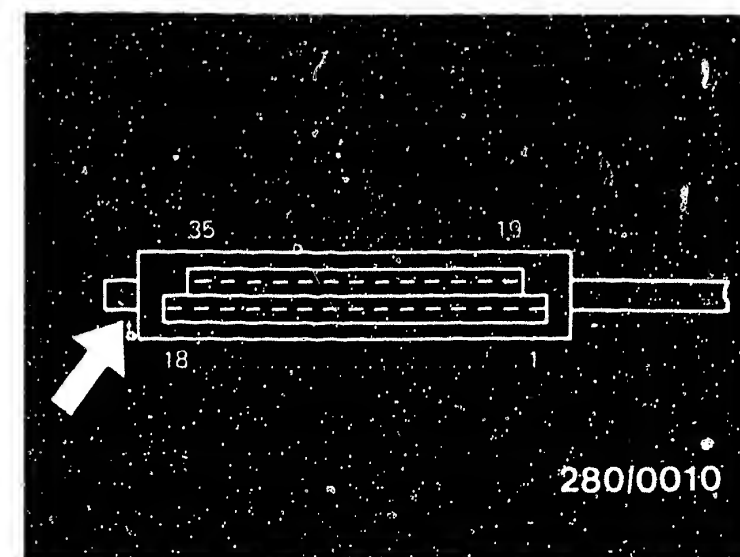
(*) New identification markings on the air-flow sensor



- 1 = Air-flow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

Top view of 35-pin multiple plug of Motronic wiring harness

K1. 1 (Term. 1) = Plug-in connection to tachometer



E22

Testing with universal test adapter
Porsche 911 Carrera



E23

Testing with universal test adapter
Porsche 911 Carrera



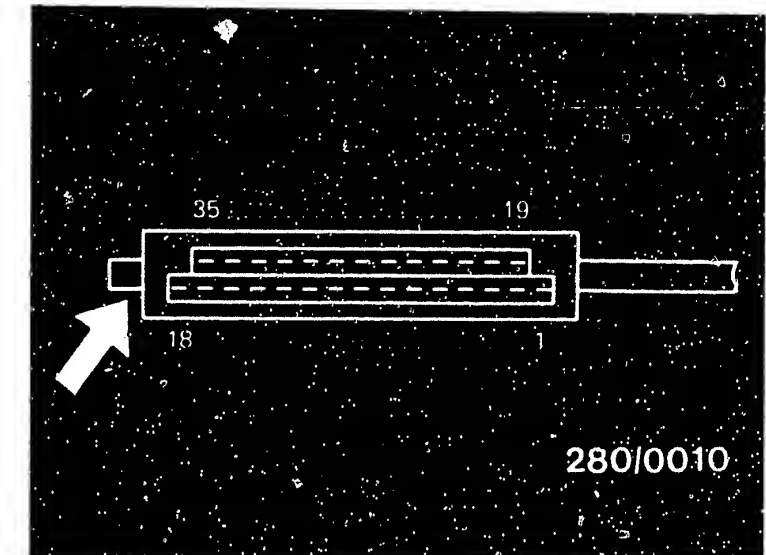
Test steps 25 and 26 deleted

Test step 27		Reading	Testing
Operation			
Program switch position "V"	12	8...15 V while cranking	<u>Component:</u> Lead 4 from starting motor Term. 50 to multiple plug Term. 4
Program switch position "Ω"	15		
<u>Measuring equipment:</u> Voltmeter			
<u>Measuring range:</u> 15 V			<u>Operation:</u> Voltage test at terminal 4
Connection: Test sockets (red = +, black = ground)	V	yes no	
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor.		Continue testing with next test step.	
			<u>Malfunction:</u> Voltage less than 8 V

Trouble-shooting:

1. Voltage less than 8 V:

- Test voltage drop at starting motor terminal 50.
- Check lead from multiple plug terminal 4 to starting motor terminal 50.



Top view of plug on 35-pole multiple
of Motronic wiring harness
Arrow = Lug with mechanical cooling



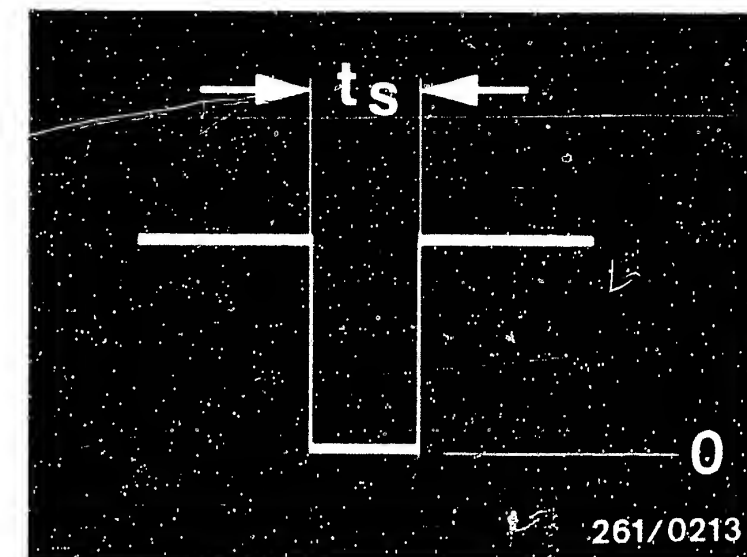
Test step 28		
Operation	Reading	Testing
Program switch position "V"	13	<u>Component:</u> Control unit
Program switch position "0"	15	
<u>Measuring equipment:</u> Motortester, oscilloscope	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ </div> <div style="text-align: center;"> no ↓ </div> </div>	<u>Operation:</u> Dwell-period signal at terminal 21 and ground
<u>Measuring range:</u> Special input		<u>Malfunction:</u> No signal
<u>Connection:</u> Test wells; red clip to red well, black clip to black well		
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor	Continue testing with next test step.	

Trouble-shooting:

- Replace control unit

Note:

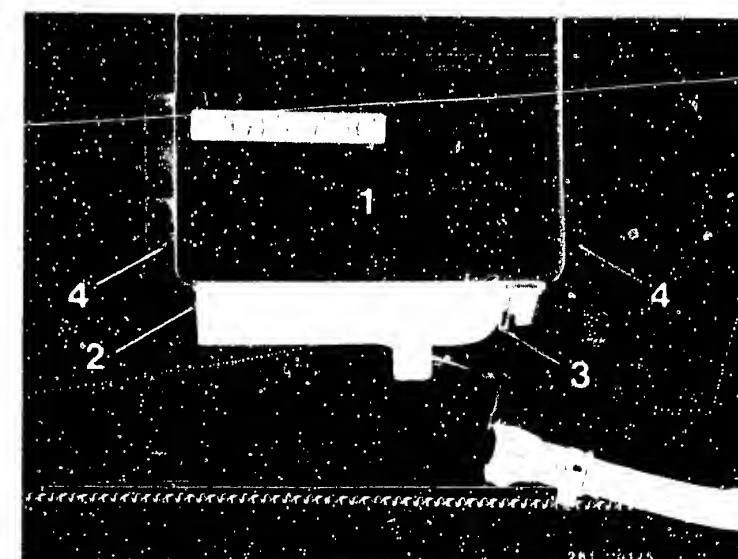
In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins



t_s = Dwell period

0 = Base line

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



F3

Testing with universal test adapter
Porsche 911 Carrera



F4

Testing with universal test adapter
Porsche 911 Carrera



Test step 29

Operation

Program switch position "V"

14

Program switch position "Ω"

15

Measuring equipment:

Motortester, oscilloscope

Measuring range:

Special input

Connection: Test wells; red clip to red well, black clip to black well

Operation in vehicle:

Shift gear to neutral and operate starting motor

Reading

Fuel-injection signal on the electric fuel-injection valve (see figure at top)

yes

no

Continue testing with next test step.

Testing

Component:

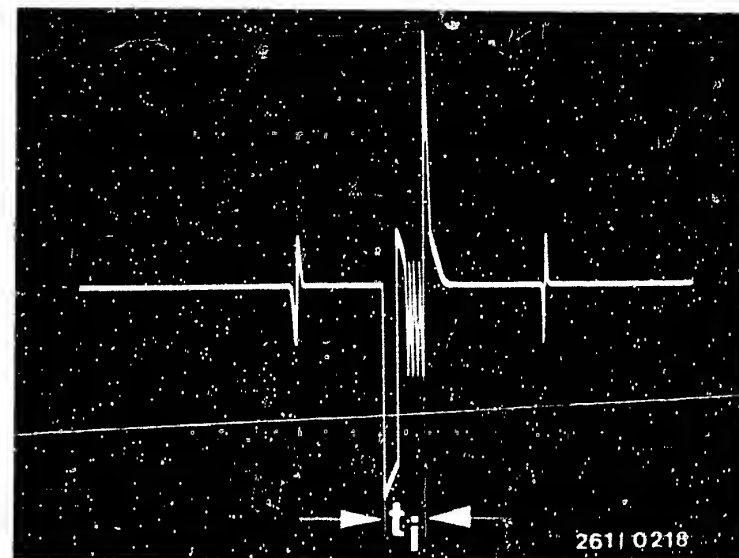
Power supply for solenoid-operated injection valves, control unit

Operation:

Injection output stage at terminal 14 and ground

Malfunction:

No signal



Fuel-injection signal (on the electric fuel-injection valve)

t_i = Fuel injection period

Arrow = Plug connection for the fuel-injection valves

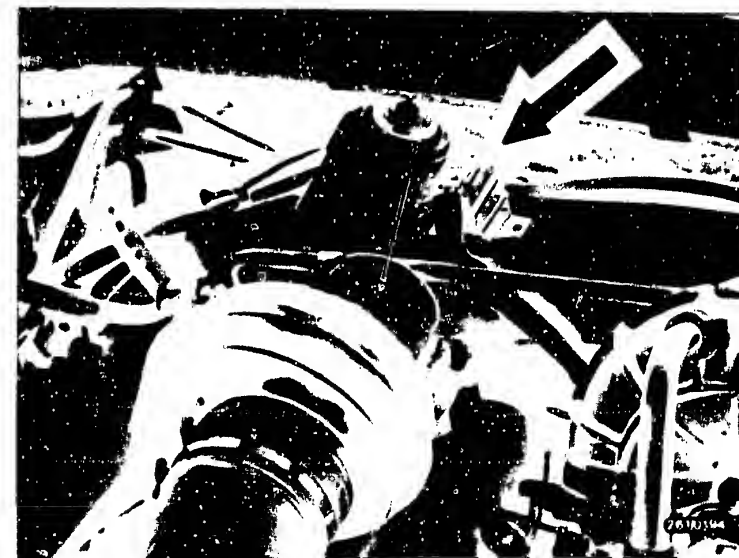
Trouble-shooting:

- Check power supply to injection valves:
Remove connector from all solenoid-operated injection valves and measure voltage to ground at both terminals. Battery voltage must be measured at each solenoid-operated injection valve connector. If no voltage, check lead via plug-in connection Term. 1 to relay set Term. 87.
- Check lead from the multiple plug Term. 14 to the electric fuel injection valves of cylinders 1, 2, and 3 via plug connection Term. 5.
- Replace control unit.

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

Continued on F 7



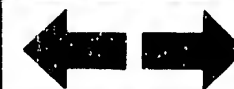
F5

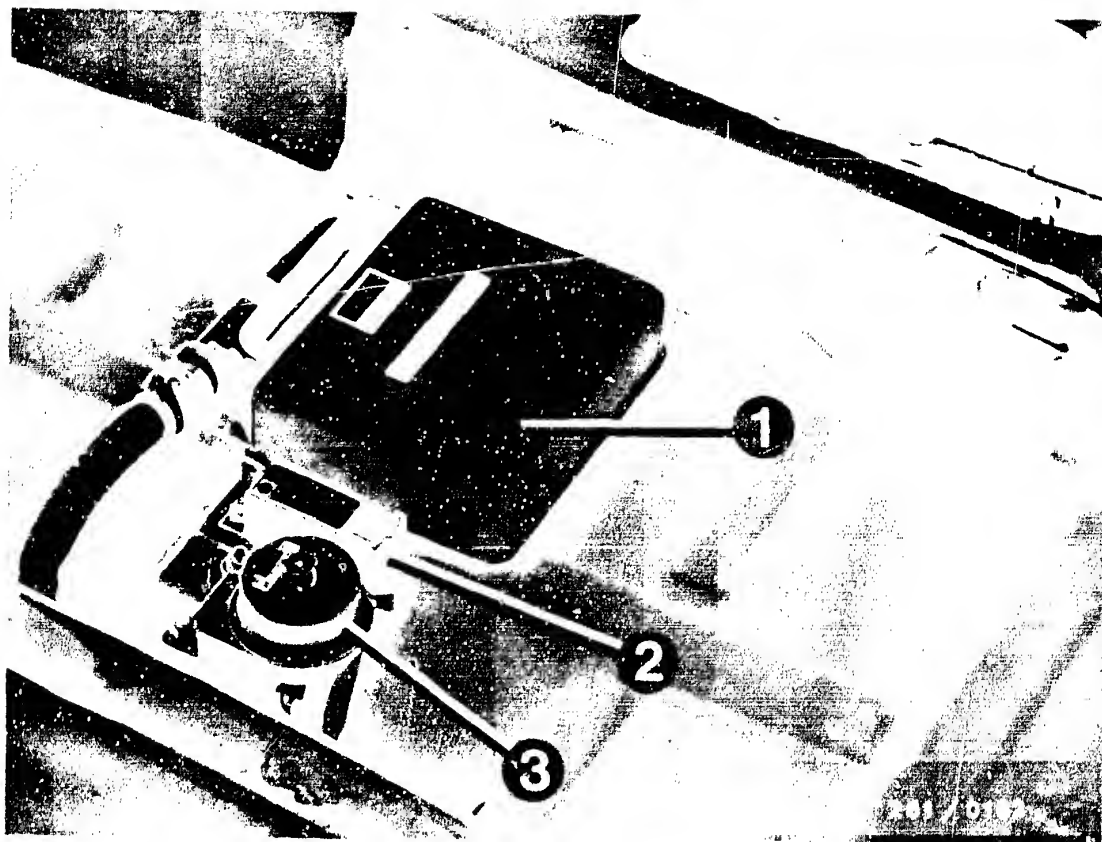
Testing with universal test adapter
Porsche 911 Carrera



F6

Testing with universal test adapter
Porsche 911 Carrera





Trouble-shooting test step 29 (continued)

- 1 = Control unit
- 2 = Main and pump relays
- 3 = Altitude sensor (USA only)

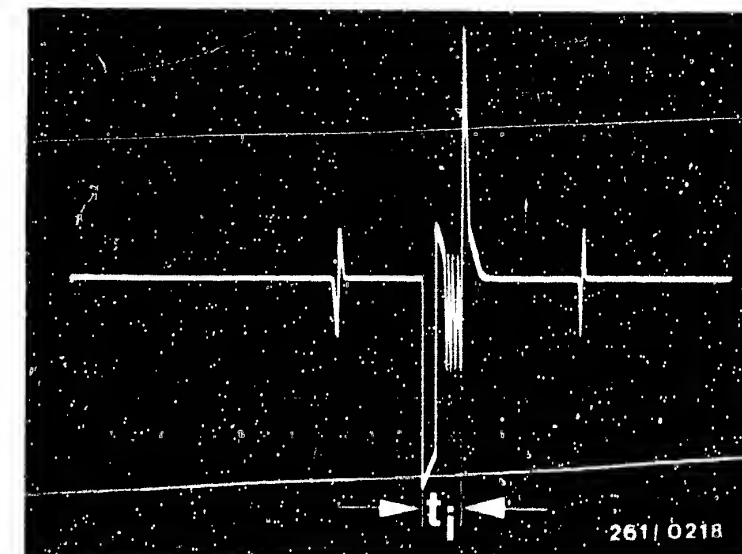
Test step 30		Reading	Testing
Operation			
Program switch position "V"	14	Fuel-injection signal (see figure at top)	Component: Control unit
Program switch position "Ω"	15	Duration of injection t_i becomes slightly longer after pressing button T1 (NTC II, cold). Only press T1 briefly; otherwise mixture will be too rich for engine.	
Measuring equipment: Motortester, oscilloscope			Operation: Influence of temperature
Measuring range: Special input			
Connection: Test wells; red clip to red well, black clip to black well			Malfunction: Signal does not become wider after pressing button T1
Operation in vehicle: Shift gear to neutral and operate starting motor			
Button: Press T1		yes ↓ Continue testing with next test step.	
		no ↓	

Trouble-shooting:

Replace control unit

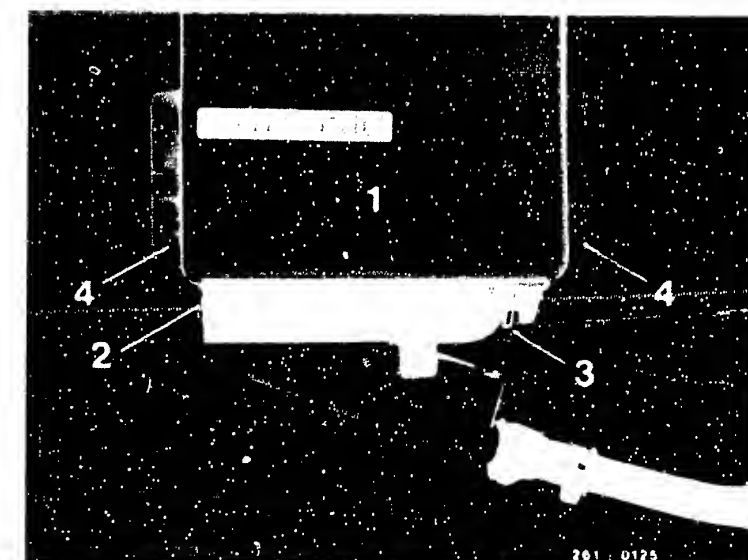
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



Fuel-injection signal
 t_i = Fuel-injection period

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



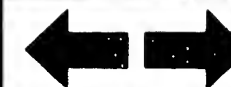
F8

Testing with universal test adapter
Porsche 911 Carrera



F9

Testing with universal test adapter
Porsche 911 Carrera



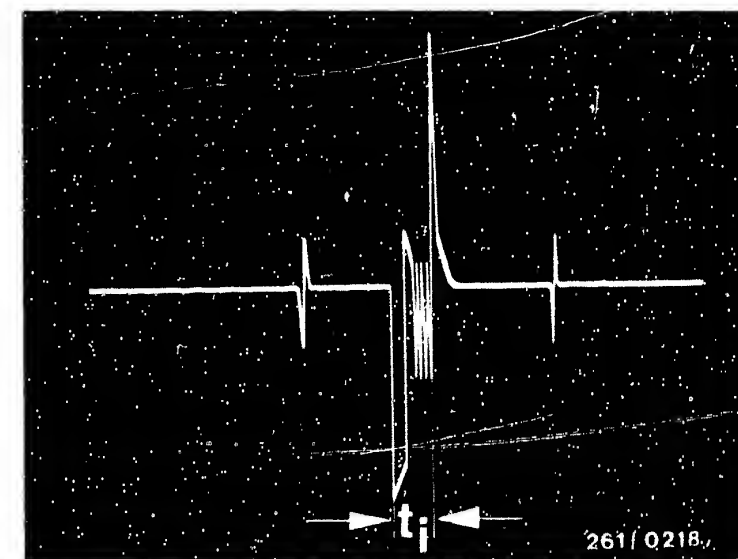
Test step 31			
Operation		Reading	Testing
Program switch position "V"	15	Fuel-injection signal (see figure at top)	Component: Control unit
Program switch position "N"	15		
Measuring equipment: Motortester, oscilloscope		<div><div></div><div>yes</div><div></div><div>no</div><div></div></div>	Operation: Injection output stage at terminal 15 and ground
Measuring range: Special input			Malfunktion: No signal
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and operate starting motor			Continue testing with next test step.

Trouble-shooting:

- Check power supply to injection valves:
Remove connector from all solenoid-operated injection valves and measure voltage to ground at both terminals. Battery voltage must be measured at each solenoid-operated injection valve connector. If no voltage, check lead via plug-in connection Term. 2 to relay set Term. 87.
- Check lead from the multiple plug Term. 15 to the electric fuel-injection valves of cylinders 4, 5, and 6 via plug connection Term. 6.
- Replace control unit.

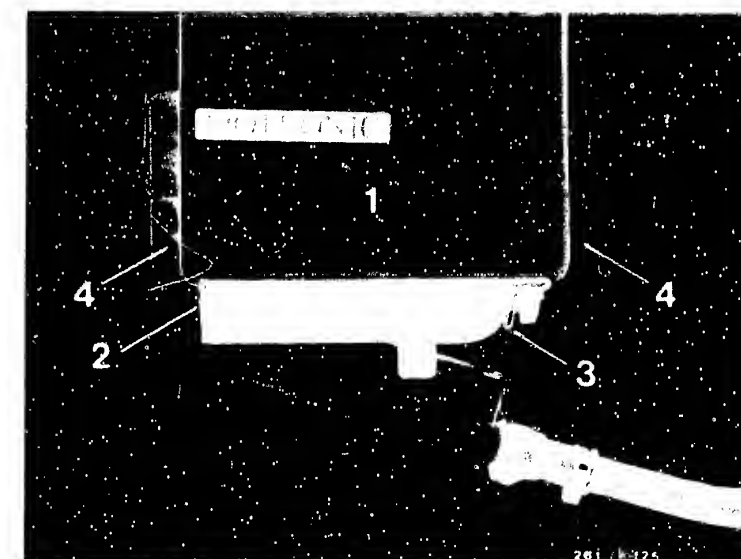
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins. - Continued on F 12 -



Fuel-injection signal
 t_i = Fuel-injection period

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



F10

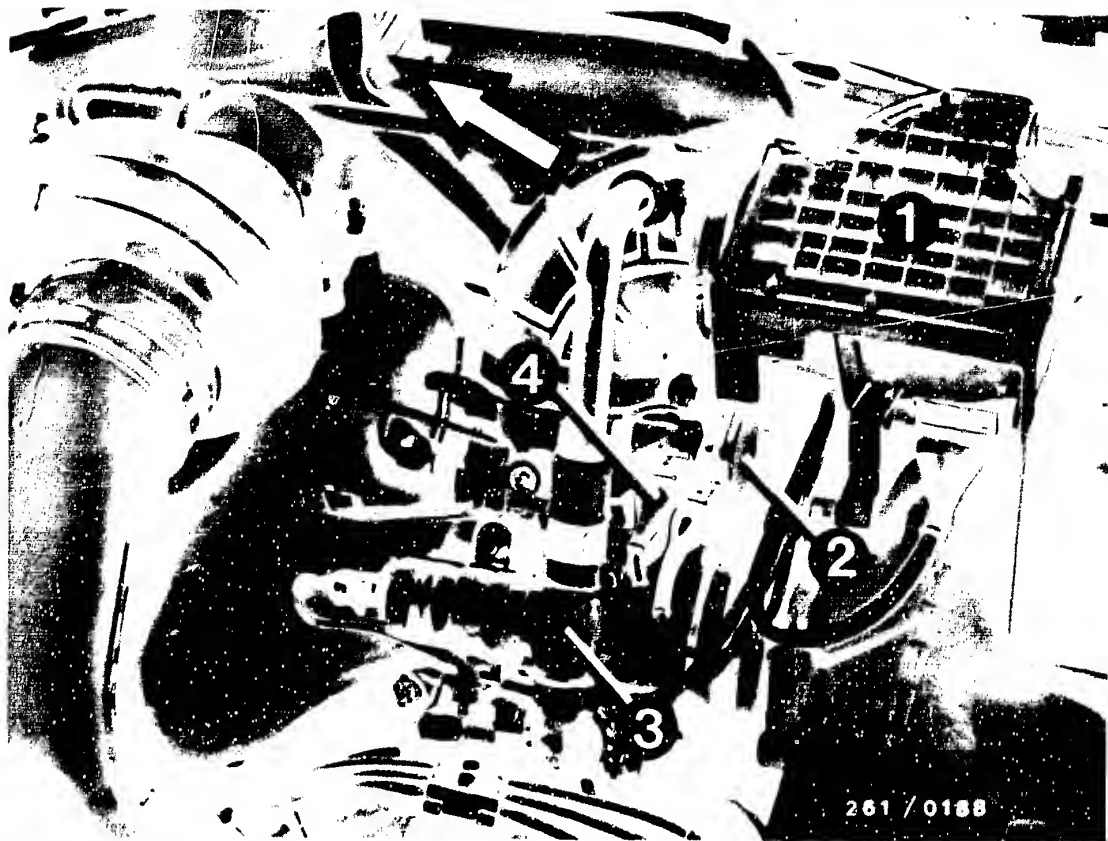
Testing with universal test adapter
Porsche 911 Carrera



F11

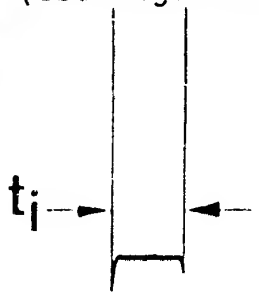
Testing with universal test adapter
Porsche 911 Carréra





Trouble-shooting test step 31 (continued)

Arrow = Plug connection for fuel-injection valves

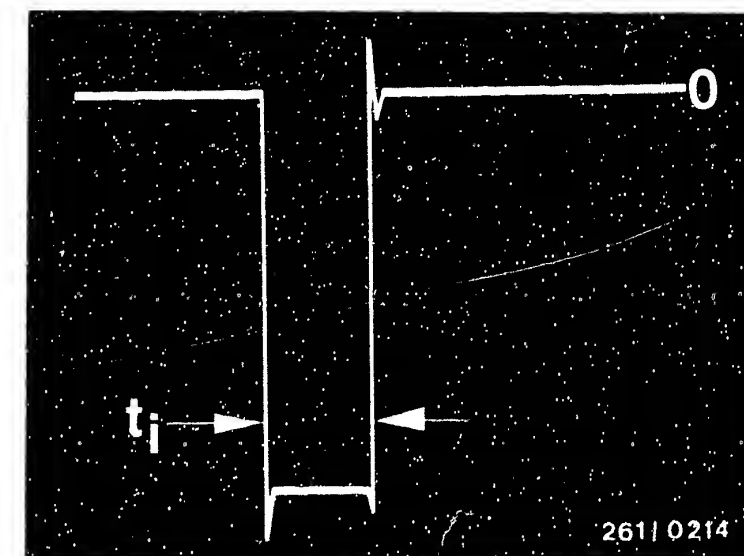
Test step 32				
Operation		Reading	Testing	
Program switch position "V"	16	Fuel-injection signal (see figure at top) 	Component: Control unit	
Program switch position "M"	15			
Measuring equipment: Motortester, oscilloscope			Operation: Injection signal at terminal 11 and ground	
Measuring range: Special input				
Connection: Test wells; red clip to red well, black clip to black well				
Operation in vehicle: Shift gear to neutral and operate starting motor				
		yes ↓ Continue testing with next test step.	no ↓	Malfunction: No signal

Trouble-shooting:

Replace control unit.

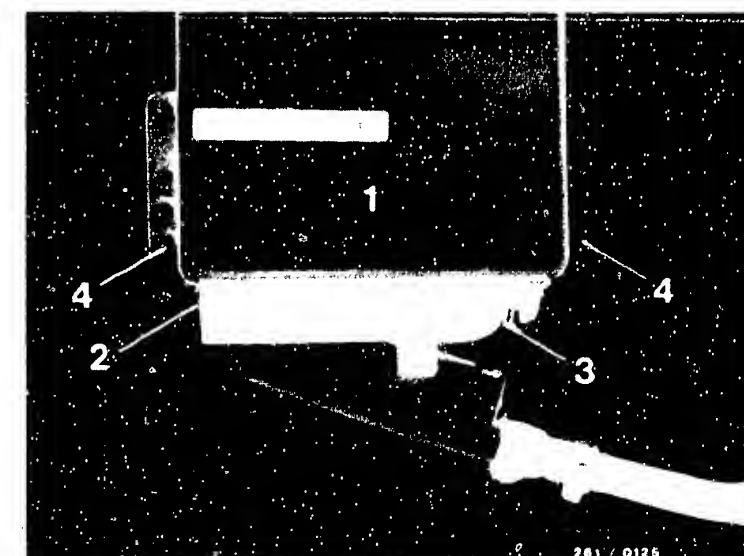
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins



Fuel-injection signal
 t_i = Fuel-injection period
 0 = Base line

1 = Control unit
 2 = Locating lug
 3 = Detent
 4 = Mounting holes



F13

Testing with universal test adapter

Porsche 911 Carrera



F14

Testing with universal test adapter

Porsche 911 Carrera



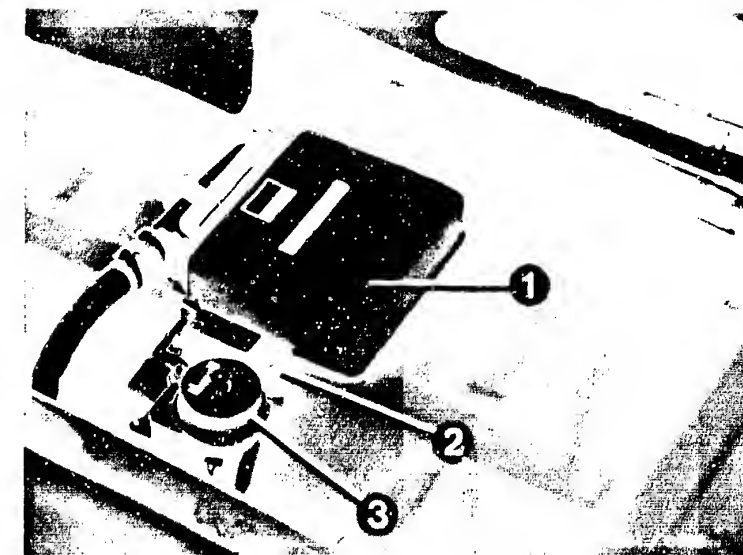
Test step 33		Plug in pump fuse No. 16	
Operation		Reading	Testing
<u>Program switch position</u> "V"	17	10...15 V	<u>Component:</u> Relay set (pump relay)
<u>Program switch position</u> "0"	15		
<u>Measuring equipment':</u> Voltmeter		<div><div>yes</div><div>no</div></div>	<u>Operation:</u> Voltage at Term. 20 to ground
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Test sockets; (red = +, black = ground)	V		<u>Malfunction:</u> Voltage less than 10 V
<u>Operation in vehicle:</u> Ignition on			
		<u>Continue</u> <u>testing with</u> <u>next test</u> <u>step.</u>	

Trouble-shooting:

- Replace relay set.
- Check lead from multiple plug Term. 20 to the relay set Term. 85b.
- Replace control unit.

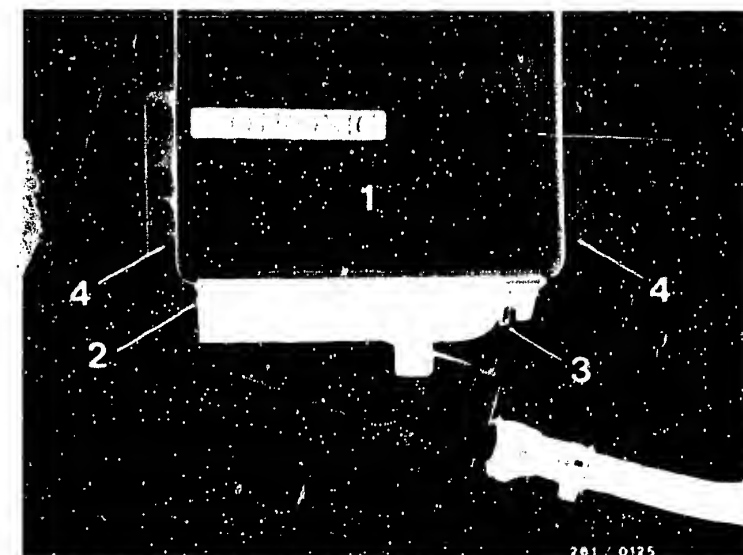
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
2 = Main and pump relays
3 = Altitude sensor (only USA)

- 1 = Control unit
2 = Locating lug
3 = Detent
4 = Mounting holes



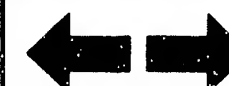
F15

Testing with universal test adapter
Porsche 911 Carrera



F16

Testing with universal test adapter
Porsche 911 Carrera



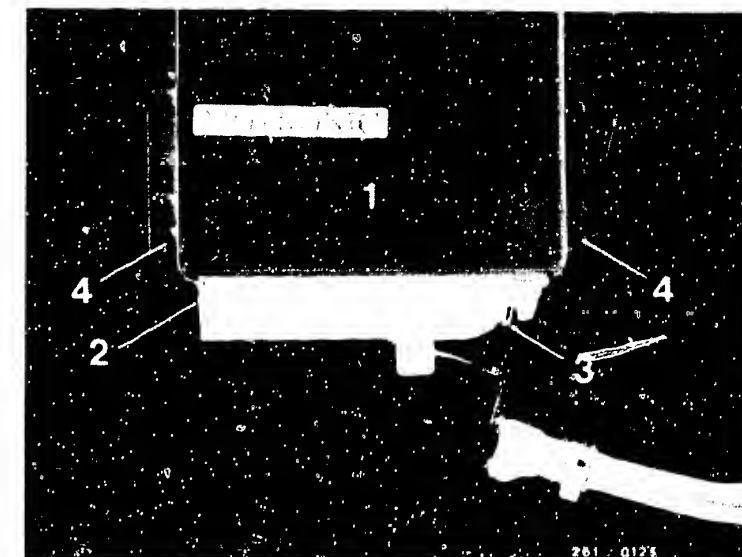
Test step 34				
Operation		Reading	Testing	
Program switch position "V"	17	max. 4 V	<u>Component:</u> Control unit	
Program switch position "Ω"	15			
<u>Measuring equipment:</u> Voltmeter		<div><div></div><div></div></div>	<u>Operation:</u> Pump control Term. 20 to ground	
<u>Measuring range:</u> 15 V				
Connection: Test sockets; (red = +, black = ground)	V		<div><div>yes</div><div>no</div></div>	<u>Malfunction:</u> Voltage greater than 4 V
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor		<u>Continue</u> <u>testing with</u> <u>next test</u> <u>step.</u>		

Trouble-shooting:

Replace control unit

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Locating lug
- 3 = Detenting
- 4 = Mounting holes

F17

Testing with universal test adapter

Porsche 911 Carrera



F18

Testing with universal test adapter

Porsche 911 Carrera



Test step 35 Switch off ignition. Connect pressure gauge.			
Operation		Reading	Testing
Program switch position "V"	17	2.3 to 2.7 bar If reading O.K., continue testing with test step 36.	<u>Component:</u> Pump relay, fuel pump, pressure regulator
Program switch position "M"	15		
<u>Measuring equipment:</u> Pressure gauge		<div><div></div><div>yes</div><div>no</div><div>Continue testing with next test step.</div></div>	
<u>Measuring range:</u> 0 to 6 bar			<u>Operation:</u> Fuel pressure
<u>Connection:</u> At test connection			
<u>Operation in vehicle:</u> Switch on ignition			
<u>Button:</u> Press T3			<u>Malfunction:</u> No fuel pressure or pressure outside tolerance

Note:

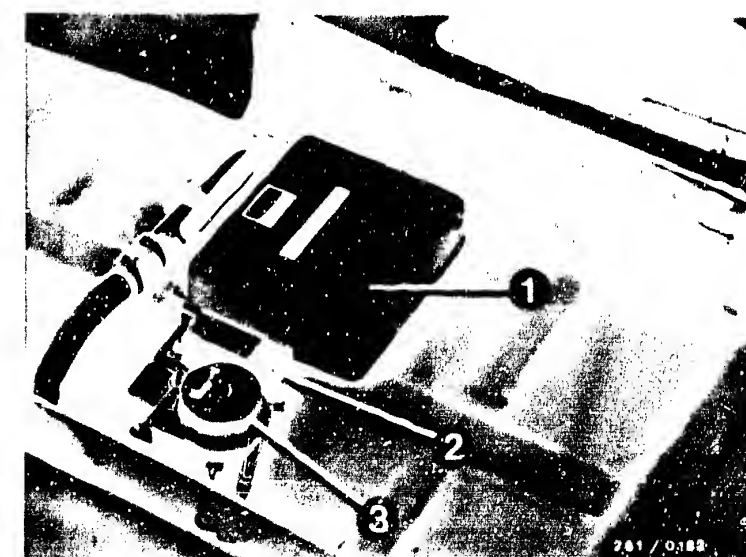
Mount pressure gauge (2) at test connection (1) on fuel-distribution pipe. Pay attention to built-in ball when opening the cap nut. Catch any escaping gasoline. Danger of fire with hot engine and electric sparks.

Continued on F21/F22



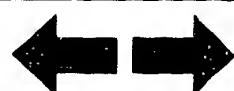
1 = Test connection
2 = Pressure gauge

1 = Control unit
2 = Main and pump relays
3 = Altitude sensor (only USA)



F19

Testing with universal test adapter
Porsche 911 Carrera



F20

Testing with universal test adapter
Porsche 911 Carrera



Trouble-shooting - test step 35

1. Pressure 0 bar, no pumping noises can be heard:

- Check pump fuse 16.
- Replace relay set.
- Measure voltage at disconnected pump plug.

No voltage:

Check lead from fuel pump to relay set Term. 87b as well as pump ground lead.

- Voltage present:

Test pressure regulator and fuel pump, as described under 2. below.

2. Pressure outside tolerance, fuel pump operating:

- Fuel pressure too low:

Slowly pinch off return line with hose clammer. Pressure rises above 4 bar → replace pressure regulator.

Pressure remains below 4 bar → replace fuel pump.

Taking out and replacing the fuel pump

Unscrew the cover plate on the front axle crossbeam. Crip off the fuel suction line so that no fuel can escape. Take off the fuel pump. When installing, make certain that the fuel pump does not touch any parts around it (source of noise). Use new seal rings to connect the supply line.

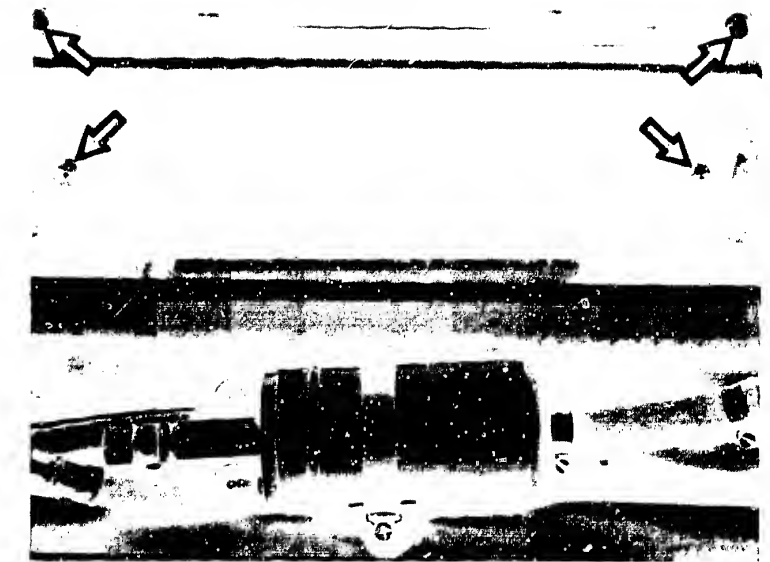
Screw the cover plate back on.

Tighten the fastening elements with the prescribed tightening torques:

Socket hex screws = 47 Nm,

Self-locking nuts = 28 Nm.

If need be, use new lock nuts.



Top: Cover plate for fuel pump

Arrow = Fastening bolts and nuts

Bottom: Fuel pump.

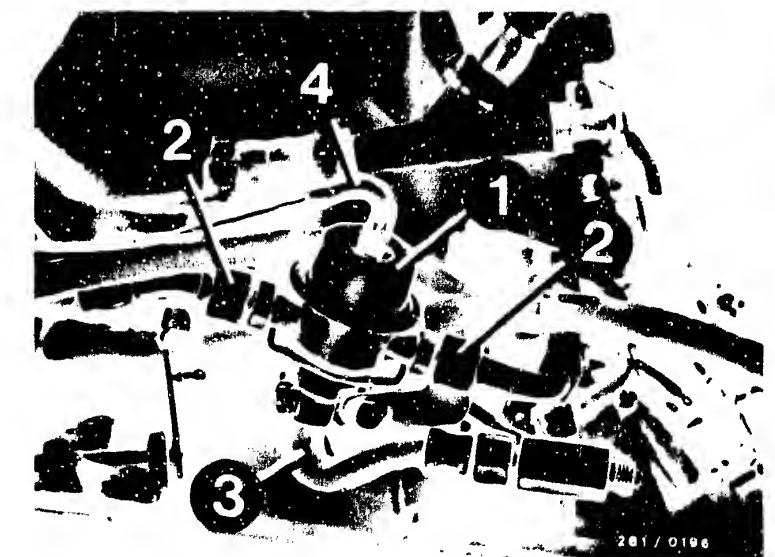
The intake line at the right in the picture

1 = Pressure regulator

2 = Fuel supply line

3 = Fuel return line

4 = Air hose to the intake manifold



Continued on F 23/F 24

F21

Testing with universal test adapter
Porsche 911 Carrers



F22

Testing with universal test adapter
Porsche 911 Carrera

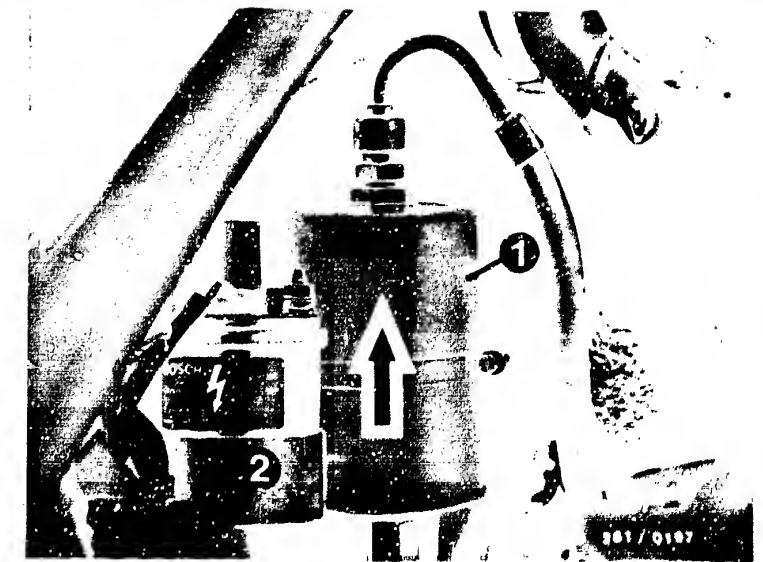


Trouble-shooting - test step 35 (continued)

- Check fuel line and fuel filter for throughflow. Fuel lines pinched?
- Strainer in tank clogged?
- Corrosion in tank?

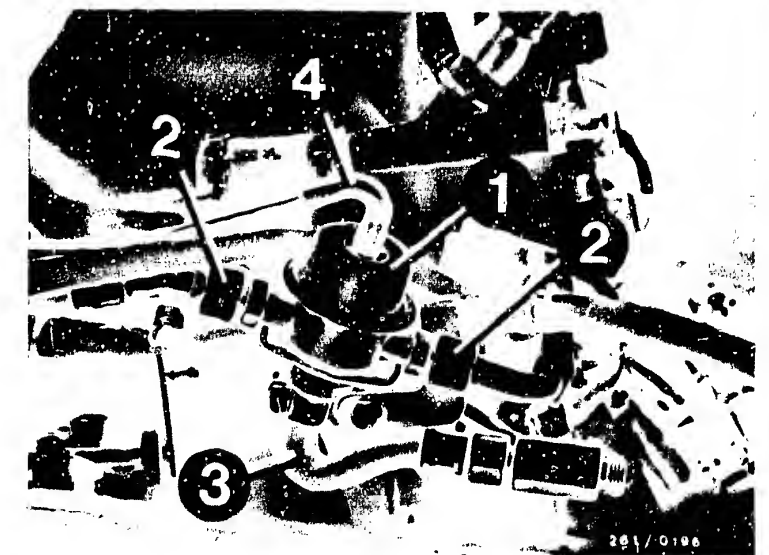
3. Fuel pressure above 2.7 bar:

- Fuel return line clogged or pinched.
- Replace pressure regulator



1 = Fuel filter
2 = Ignition coil
Arrow = Direction of flow

1 = Pressure regulator
2 = Fuel delivery line
3 = Fuel return line
4 = Air hose to the intake manifold



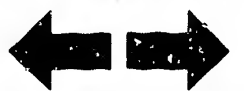
F23

Testing with universal test adapter
Porsche 911 Carrera



F24

Testing with universal test adapter
Porsche 911 Carrera



N.B.:

The following test steps can be carried out only with the engine running.
If the engine is not running, continue according to the trouble-shooting you have selected.

For detailed trouble-shooting, see C 3 - C 4

For targeted trouble-shooting, see C5 - C10

For further trouble-shooting, leave test adapter, control unit, pressure gauge connected.

TEST STEP 36

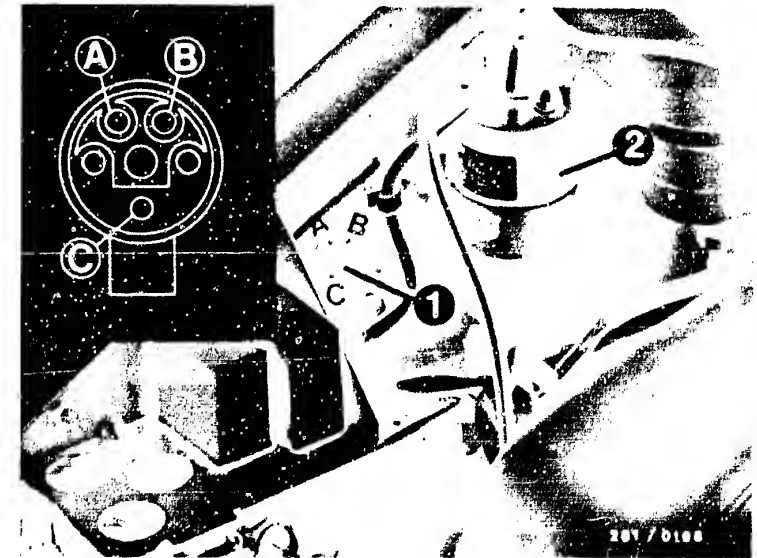
Connect motortester and CO-Tester.

Operation	Reading	Testing
Program switch - setting "V"	17	Components: Engine, leaks in intake system
Program switch - setting "C"	15	
Test equipment: Motortester and CO-Tester	Maintain sequence. First do the CO-test. Conditions: Engine at normal operating temperature, load devices switched off, ambient tempera- ture 15°C ... 35°C. CO-value: 1.0...1.5 vol. % CO*) S/CH/AUS: 0.5...1.0 vol. % CO*) USA/Japan: 0.6...1.0 vol. % CO**)*)	Function: Idle speed and exhaust gas
Range of measurement: Rotational speed and CO		
Connection: Ignition coil, exhaust		Malfunction: Values not within tolerance
Operation in the Vehicle: Have the engine run till it is at normal operating temperature		

*) Do the adjustments as quickly as possible so that the intake paths do not overheat, thus distorting the CO reading. The ambient air taken in must be between 15°C and 35°C in order to guarantee a correct adjustment. Press button T2. The reading for CO must not change when that is done. If that reading changes, the engine is not yet at normal operating temperature.

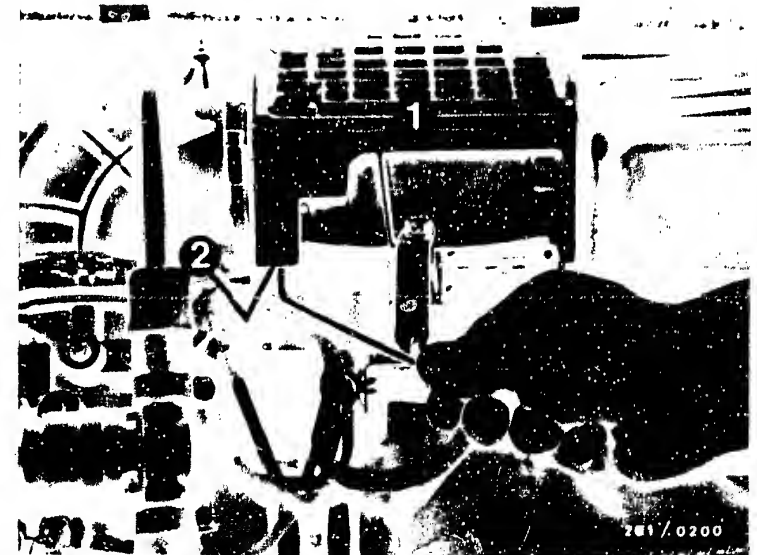
**) Connect the CO-Tester to the test fitting in front of the catalytic converter. The lambda sensor is interrupted by the test adapter.

Continued on G 3/G 4



1 = Test socket
2 = Ignition coil

1 = Air-flow sensor
2 = Idle-mixture-adjusting screw



G1

Testing with universal test adapter
Porsche 911 Carrera



G2

Testing with universal test adapter
Porsche 911 Carrera



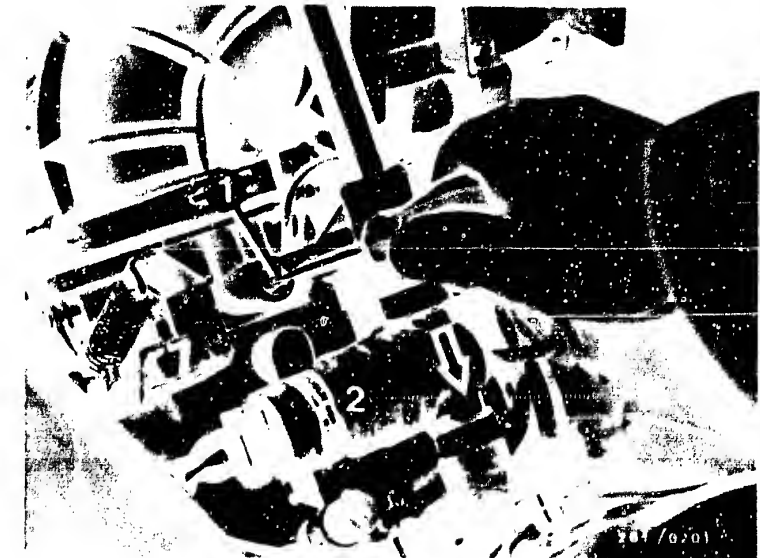
Trouble-shooting test step 36 (continued)

- Adjust the idle speed on the idle-speed adjusting screw in the throttle-valve assembly.
- Adjust the exhaust gas with the idle-mixture-adjusting screw in the air-flow sensor. To do this, remove the plug in the air-flow sensor. Use a special tool for USA/Japan vehicles. Put in a new plug when the adjustment has been completed.

Turn the idle-mixture-adjusting screw to the right:
The CO-value becomes greater.

Turn the idle-mixture-adjusting screw to the left:
The CO-value becomes smaller.

If the exhaust gas value is less than 1.0 vol. % CO, and can no longer be adjusted: Check the suction side and the exhaust unit for leaks (unmetered air).



1 = Idle-speed adjusting screw
2 = Idle actuator

Arrow = Testing fitting in front of
the catalytic converter



G3

Testing with universal test adapter
Porsche 911 Carrera



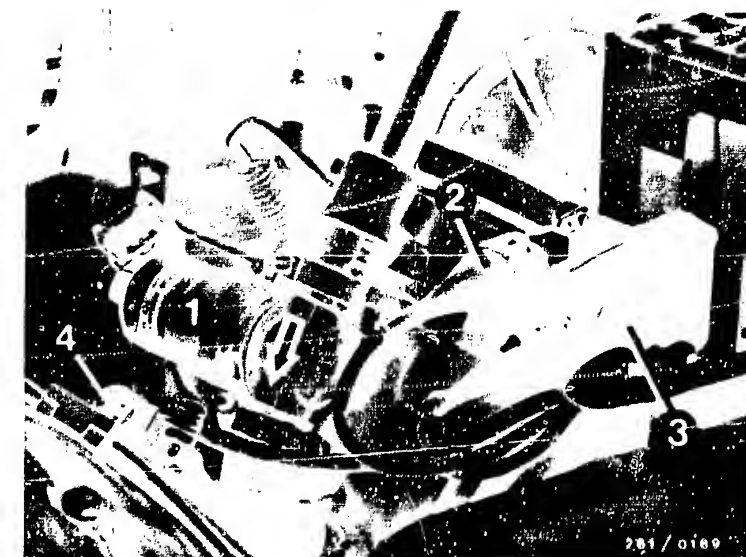
G4

Testing with universal test adapter
Porsche 911 Carrera



Test step 37

Operation		Reading	Testing
Program switch position "V"	17	1. With the engine at normal operating temperature and at idle speed: $-6^{\circ} \dots 0^{\circ}$ S/CH/AUS/Japan: $-10^{\circ} \dots -4^{\circ}$	<u>Component:</u> Control unit
Program switch position "Ω"	15		
Measuring equipment: Motortester		2. Press button T6 (full load) and increase rotational speed to 3800 min^{-1} : <u>Timing advance angle</u> $22^{\circ} \dots 28^{\circ}$ S/CH/AUS: $23^{\circ} \dots 29^{\circ}$ USA/Japan: $22^{\circ} \dots 28^{\circ}$ <u>Note:</u> The diagnosis cable must be used for measurement of the ignition timing angle, because the ignition advance is negative (late) at idle speed.	<u>Operation:</u> Spark advance at idle and at full load
Measuring range: Spark advance			
Connection: Diagnosis cable			<u>Malfunction:</u> Spark advance outside tolerance
Operation in vehicle: Allow engine to reach operating temperature.			



- 1 = Idle actuator
- 2 = Plug from the microswitch
- 3 = Throttle valve switch
- 4 = Diagnosis plug

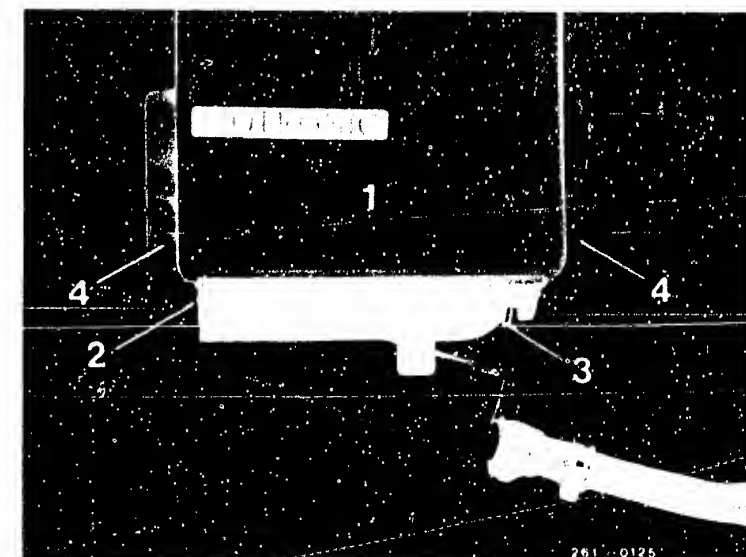
- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

Trouble-shooting:

- Concerning 1. (above): Check idle speed accurately once again, and repeat test step. Idle speed must be between 800 and 850 min^{-1} , otherwise a different spark advance will be indicated.
- Concerning 2.: Bring engine up to stated engine speed once again and read off spark advance
- Replace control unit

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



G5

Testing with universal test adapter
Porsche 911 Carrera

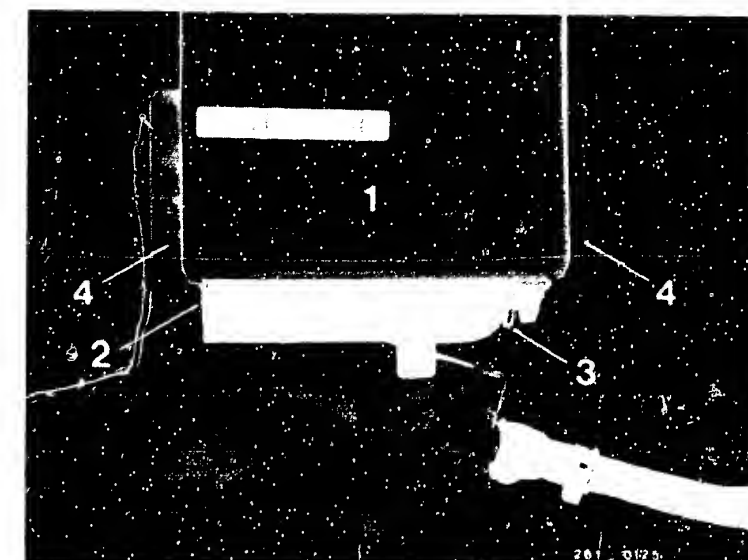


G6

Testing with universal test adapter
Porsche 911 Carrera



Test step 38			
Operation		Reading	Testing
Program switch position "V"	17	1. With engine at normal operating temperature and at idle speed: 8... 20 2. At 3000 min ⁻¹ 25...42	Component: Control unit
Program switch position "II"	15		
Measuring equipment: Motortester			Operation: Dwell angle
Measuring range: Dwell angle		<div>yes</div> <div>no</div>	Malfunction: Dwell angle outside tolerance
Connection: Ignition coil			
Operation in vehicle: Let engine run			
		Continue testing with next test step.	



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

Trouble-shooting:

Replace control unit

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

G7

Testing with universal test adapter
Porsche 911 Carrera

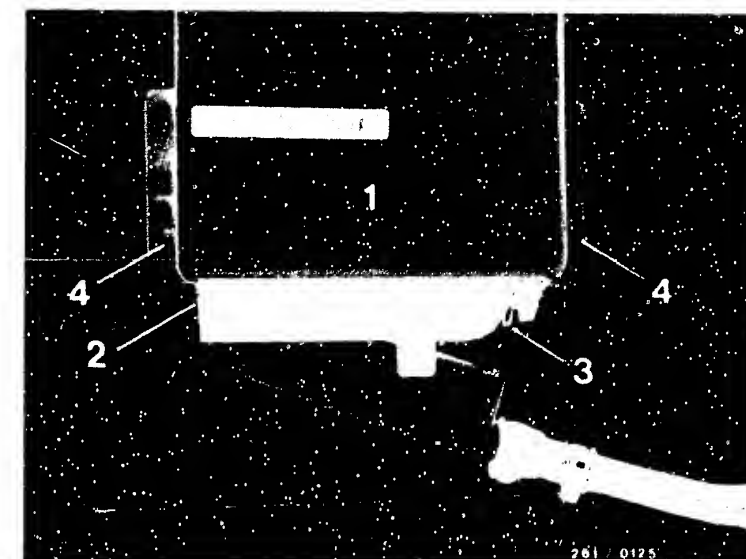


G8

Testing with universal test adapter
Porsche 911 Carrera



Test step 39			
Operation		Reading	Testing
Program switch position <u>"V"</u>	17	Engine at normal operating temperature. Engine speed 3000 min ⁻¹ (keep accelerator in same position). Press button T5: i.e., the rotational speed drops and then climbs again (fuel-injection signals stop and then return at approx. 1100 min ⁻¹). The fluctuations in rotational speed continue as long as button T5 is pressed.	<u>Component:</u> Control unit
Program switch position <u>"0"</u>	15		
<u>Measuring equipment:</u> Motortester			<div><div>yes</div><div>Continue testing with next test step</div></div>
<u>Measuring range:</u> Engine speed			
<u>Connection:</u> Ignition coil		<u>Malfunction:</u> No cutoff	
<u>Operation in vehicle:</u> Let engine run			
<u>Button:</u> Press T5			



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

Trouble-shooting:

Replace control unit

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

G9

Testing with universal test adapter
Porsche 911 Carrera



G10

Testing with universal test adapter
Porsche 911 Carrera



TEST STEP 40		
Operation	Reading	Testing
Program switch - setting "V"	18	Components: Control unit, idle actuator
Program switch - setting "I"	15	
Test equipment: Motortester, pocket-tester	1. Signals present (see figure at top) 2. On/off ratio (dwell angle) with pocket- tester $31 \% + 5 \%$ Measurement with engine at normal operating tem- perature and idle speed (idle contact closed and air conditioner switched off), and with Term. B and C connected at the test socket.	Function: On/off ratio of the idle speed control between Term. 33 and Term. 5
Range of measurement: Oscilloscope, dwell angle		Malfunction: 1. No signal 2. On/off ratio deviates considerably
Connection: Test wells; red clip to red well, black clip to black well		
Operation in the vehicle: Have the engine run		

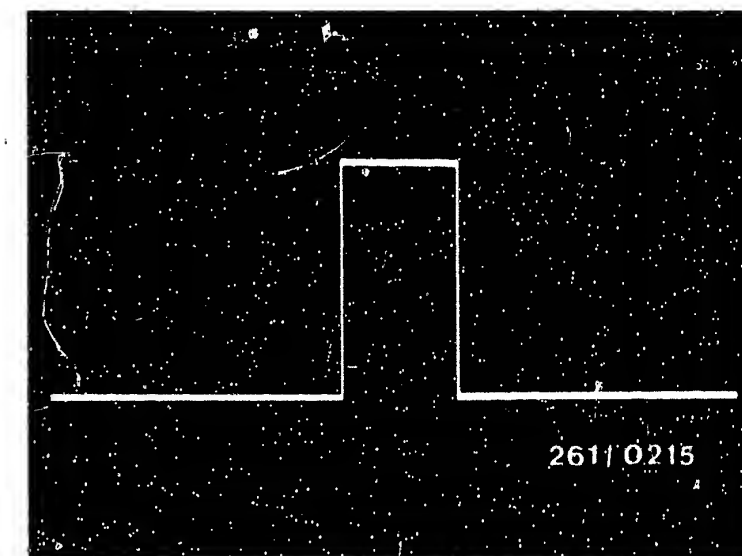
Trouble-shooting:

- Measure the internal resistance in the idle actuator:
Term. 4 to Term. 5: $17 \dots 19.5 \Omega$ (at 20°C)
Term. 4 to Term. 3: $19 \dots 21.5 \Omega$ (at 20°C)
When taking out and replacing the idle actuator, watch the
direction of flow through it (arrow).
- Take out and replace the control unit.

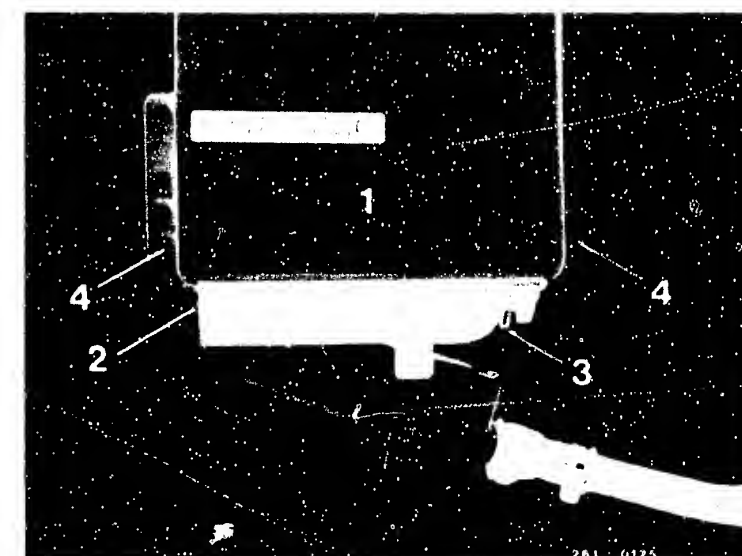
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

Continued on G13



- 1 = Control unit
- 2 = Plug lug
- 3 = Plug lock
- 4 = Fastening holes



G11

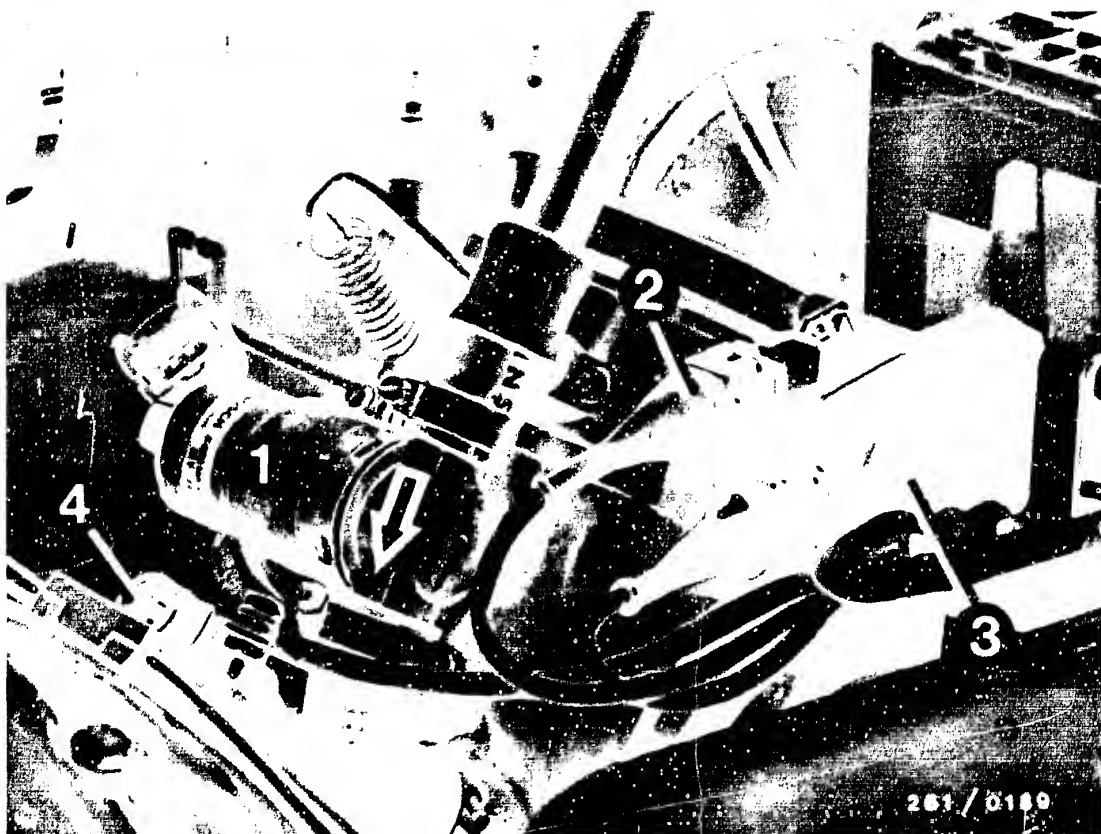
Testing with universal test adapter
Porsche 911 Carrera



G12

Testing with universal test adapter
Porsche 911 Carrera





Trouble-shooting test step 40 (continued)

- 1 = Idle actuator
- 2 = Plug from microswitch
- 3 = Throttle valve switch (full-load contact only)
- Arrow = Direction of flow



<u>TEST STEP 41</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			
<u>Program switch - setting "V"</u>	19	1. Signals present (see figure at top) 2. On/off ratio (dwell angle) with Pocket-Tester <u>69 % ± 5 %</u>	<u>Components:</u> Control unit, idle actuator
<u>Program switch - setting "I"</u>	15		
<u>Test equipment:</u> Motortester, Pocket-Tester		Measurement with engine at normal operating temperature and idle speed (idle contact closed and air conditioner switched off), and with Term. B and C connected at the test socket.	<u>Function:</u> On/off ratio of the idle speed control between Term. 34 and Term. 5
<u>Range of measurement:</u> Oscilloscope, dwell angle			
<u>Connection:</u> Measuring wells; Red clip to red well, black clip to black well			
<u>Operation in the vehicle:</u> Have the engine run			

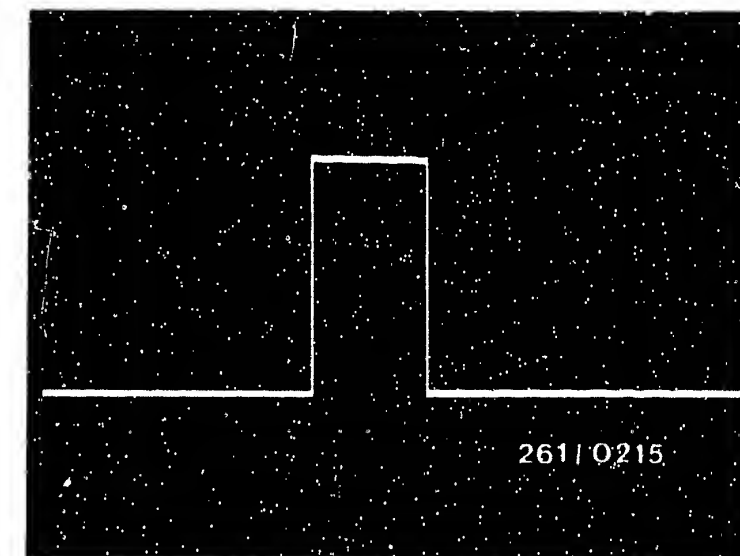
Trouble-shooting:

- Measure internal resistance of idle actuator:
 Term. 4 to Term. 5: $17 \dots 19.5 \Omega$ (at 20°C)
 Term. 4 to Term. 3: $19 \dots 21.5 \Omega$ (at 20°C)
 When taking out and replacing the idle actuator, watch the direction of flow through it (arrow).
- Take out and replace the control unit

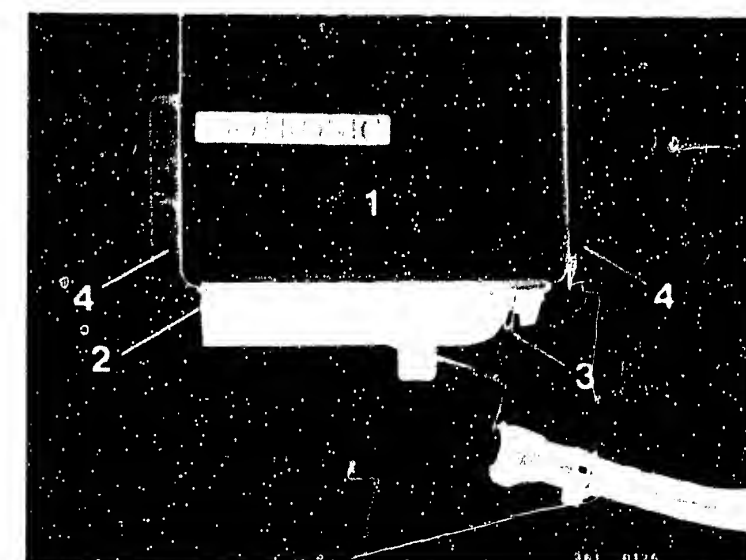
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

Continued on G 16



- 1 = Control unit
- 2 = Plug lug
- 3 = Plug lock
- 4 = Fastening holes



G 14

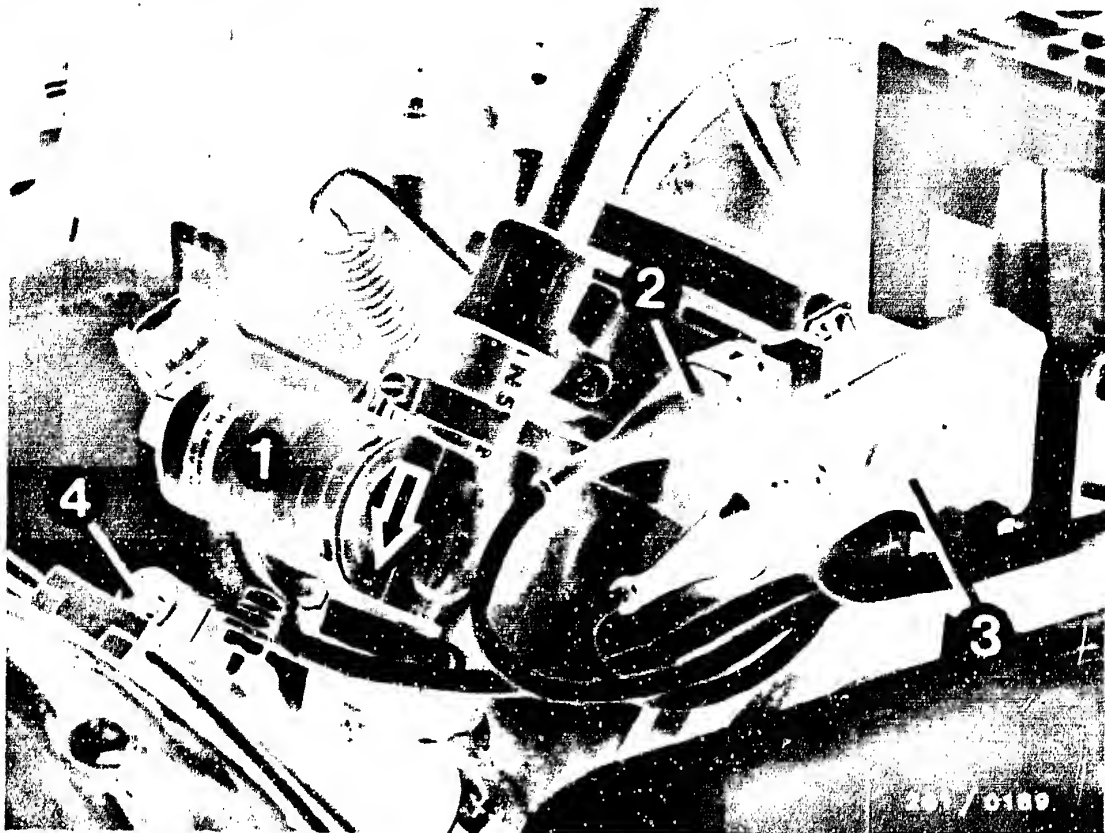
Testing with universal test adapter
Porsche 911 Carrera



G 15

Testing with universal test adapter
Porsche 911 Carrera





Trouble-shooting test step 41 (continued)

- 1 = Idle actuator
- 2 = Plug from microswitch
- 3 = Throttle valve switch (full-load contact only)
- Arrow = Direction of flow



TEST STEP 42 (for USA/Japan only) - Connect CO-Tester to test fitting

Operation		Reading	Testing
Program switch - setting "V"	20	CO rises to approx. 4 ... 5 vol. %	Components: Control unit
Program switch - setting "S"	22	After approx. 10 s, the reading for CO drops again.	
Test equipment: CO-Tester			Function: Lambda closed-loop control, top control limit, Term. 24 to ground
Range of measurement: 10 vol. %			
Connection: at test fitting		yes ↓ Continue testing with next test step	Malfunction: CO unchanged
Operation in the vehicle: Have the engine run at normal operating temperature		no ↓	



Arrow = Test fitting before the catalytic converter

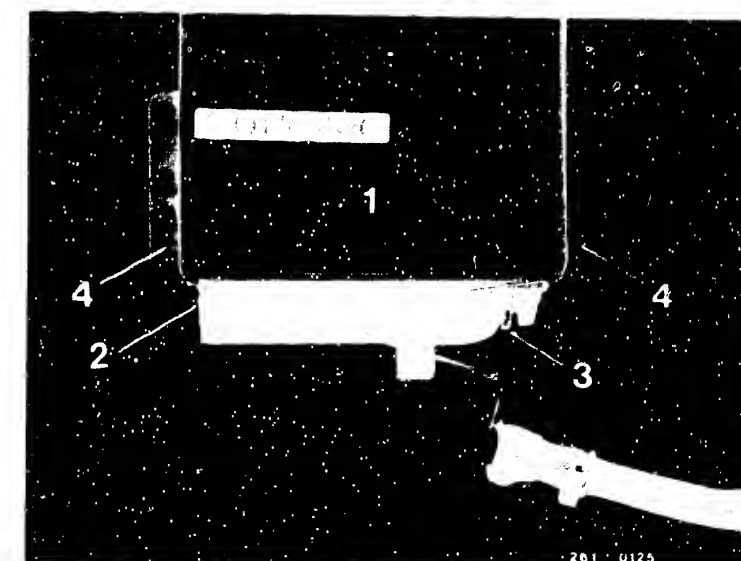
- 1 = Control unit
- 2 = Plug lug
- 3 = Plug lock
- 4 = Fastening holes

Trouble-shooting:

Take out and replace the control unit.

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



G17

Testing with universal test adapter
Porsche 911 Carrera



G18

Testing with universal test adapter
Porsche 911 Carrera



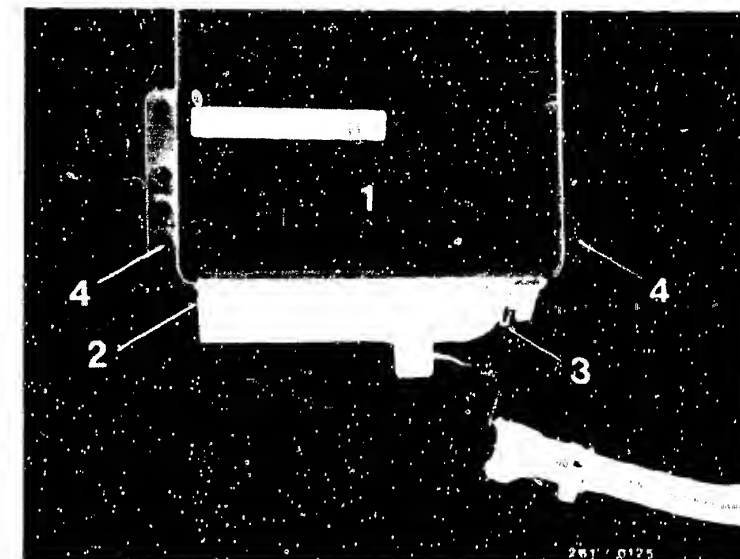
TEST STEP 43 (for USA/Japan only)			
Operation		Reading	Testing
<u>Program switch - setting "V"</u>	20	<u>CO drops under 0.6 vol. %</u>	<u>Components:</u> Control unit
<u>Program switch - setting "Ω"</u>	23	Engine runs rough	
<u>Test equipment:</u> CO-Tester		<div><div>yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div><div>no</div><div>↓</div></div>	<u>Function:</u> Lambda closed-loop control, bottom control limit, Term. 24 to +2 V
<u>Range of measurement:</u> 2.5 vol. %			
<u>Connection:</u> on the test fitting			
<u>Operation in the vehicle:</u> Have engine run			
			<u>Malfunction:</u> CO-value unchanged

Trouble-shooting:

Take out and replace control unit.

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Plug lug
- 3 = Plug lock
- 4 = Fastening holes

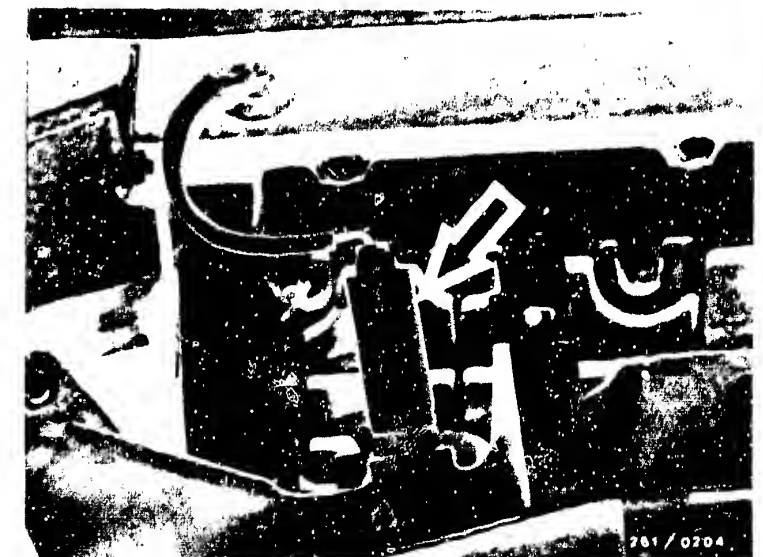


TEST STEP 44 (for USA/Japan only)			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch - setting "V"</u>	20	<u>0.6 to 1.2 vol. %</u>	<u>Components:</u> Lambda sensor
<u>Program switch - setting " "</u>	24		
<u>Test equipment:</u> CO-Tester			<u>Function:</u> Lambda closed-loop control, Term. 24 connected with lambda sensor
<u>Range of measurement:</u> 2.5 vol. %			
<u>Connection:</u> on the test fitting			<u>Malfunction:</u> CO-value not within tolerance
<u>Operation in the vehicle:</u> Have the engine run			



- 1 = Plug connection from lambda sensor
2 = Plug connection from lambda sensor heater

Arrow = Lambda sensor



Trouble-shooting:

1. Take out and replace the lambda sensor

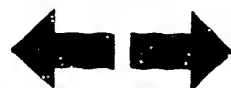
When taking out and replacing the sensor, coat its threads with the special assembly paste VS 14016 Ft (5 964 080 105). Make certain that only threads are filled and no paste gets into the slots.

Clean the plug connection of the sensor lead if need be before taking it apart. Do not get any dirt into the plug when making the plug connection and make certain that it catches properly.

2. If 1. brings no success, take out and replace the control unit.

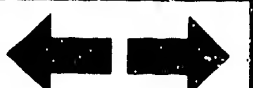
G21

Testing with universal test adapter
Porsche 911 Carrera



G22

Testing with universal test adapter
Porsche 911 Carrera



Testing with the Universal test adapter is now completed.
If the fault has not been found or if you require
further information and instructions on how to remedy
the fault, continue with the trouble-shooting program
of your choice.

Detailed trouble-shooting → see C 3-C 4

Direct trouble-shooting → see C 5-C10

G23

Testing with universal test adapter

Porsche 911 Carrera



STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS ONLY WITH GREAT DIFFICULTY

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

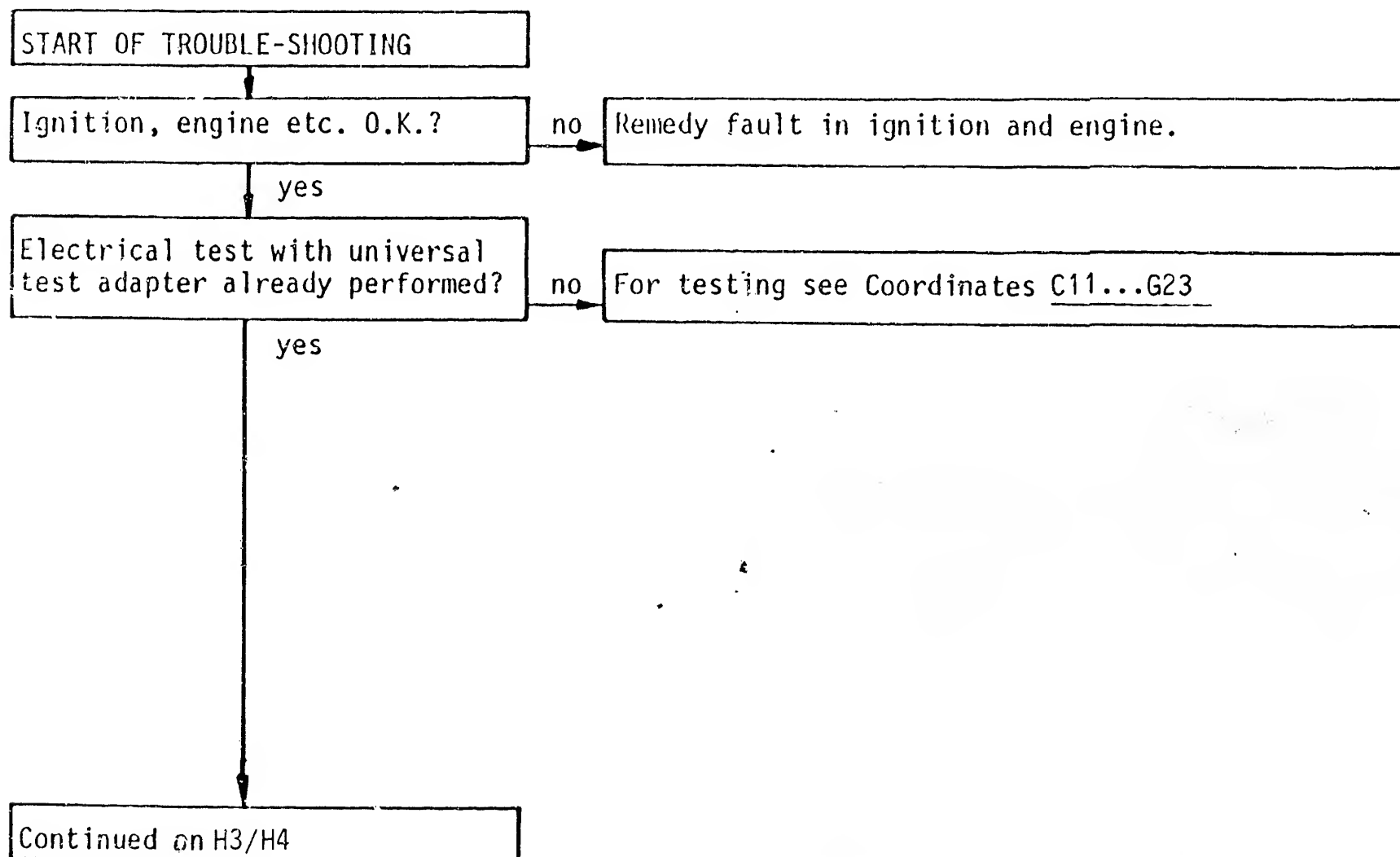
The program is divided into three rows of boxes:

- The left-hand row contains the questions on the tests.
- The middle row contains descriptions of the testing and adjustment operations on the components.
- The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



H1

Engine fails to start
Porsche 911 Carrera



H2

Engine fails to start
Porsche 911 Carrera



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check the ignition coil and the high voltage distributor: Check the distributor cap on the inside and out for dirt and burnt channels. Check that the rotor guides (flyweights) move freely.

Instructions:

Turn the engine with cylinder 1 to TDC. Adjust the distributor in such a way that the center of the rotor points to the notch on the distributor housing. Adjust the distributor with the long slot by twisting the housing. Engines where a distributor with a long slot has been installed must be given a replacement distributor with a long slot (The new model has only a hole).

When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx. 0Ω). Secondary resistance: 5 to 7.2 k Ω . Check interference-suppression resistors, H.T. ignition cables and spark plugs. Interference-suppression in:

Ignition distributor rotor:	1 k Ω
Ignition distributor - outer dome:	1 k Ω
Ignition distributor - center dome:	1 k Ω
Spark plug suppressors:	3 k Ω

yes

Are the electric fuel-injection valves O.K.? While cranking, feel all injection valves by hand. Can needle movement be felt on all valves?

no

Test injection valve with ohmmeter. Test specification: 2 to 3 Ω . Replace injection valve if defective.

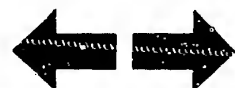
yes

Continued on H7/H8

Continued on H5/H6

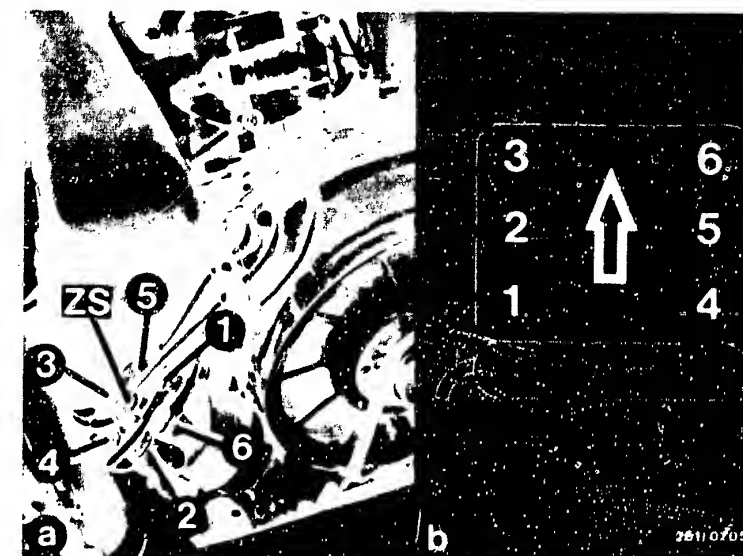
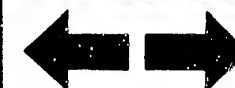
H3

Engine fails to start
Porsche 911 Carrera



H4

Engine fails to start
Porsche 911 Carrera



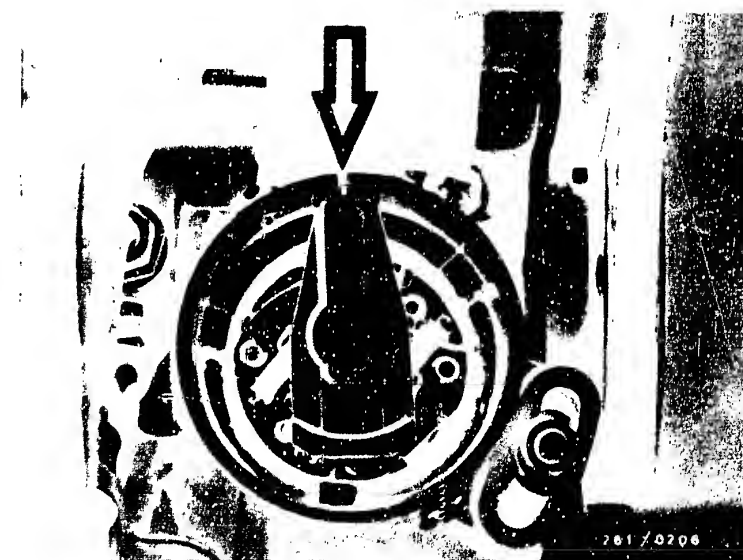
a = High voltage distributor
(turn to right)

1 to 6 = cylinder numbers

ZS = High voltage lead to
ignition coil

b = Arrangement of cylinders
(looking in direction of forward
vehicle travel)

Arrow = Center of distributor rotor
on housing marking



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

Removing the solenoid-operated injection valves

Loosen the fastening screws on the fuel-distribution pipe. Pull the fuel-distribution pipe upward until the injection valves are out of the bore in the intake manifold. Do not damage the nozzle needle or rubber seal.

Check the nozzle needle and surrounding area for leaks and deposits.

Remove the electrical connector.

Carefully slide the holding clamps out of the groove and pull the injection valve out of the fuel distribution pipe connection.

Installing the solenoid-operated injection valves

Replace the seals. Press on a new protection sleeve (contained in repair kit) so that the nozzle needle is not damaged.

Check that both rubber seals are correctly seated. Press all 4 injection valves simultaneously into their seats with the fuel-distribution pipe. Secure the fuel-distribution pipe. Check all air and fuel hoses for security. Make the electrical connections.

Start the engine and check whether any unmetered air is being drawn in.

yes

Continued on H7/H8

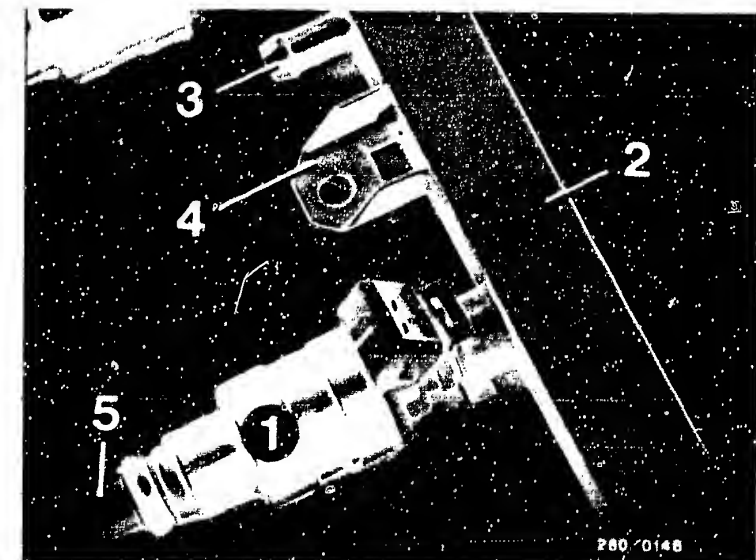
H5

Engine fails to start
Porsche 911 Carrera



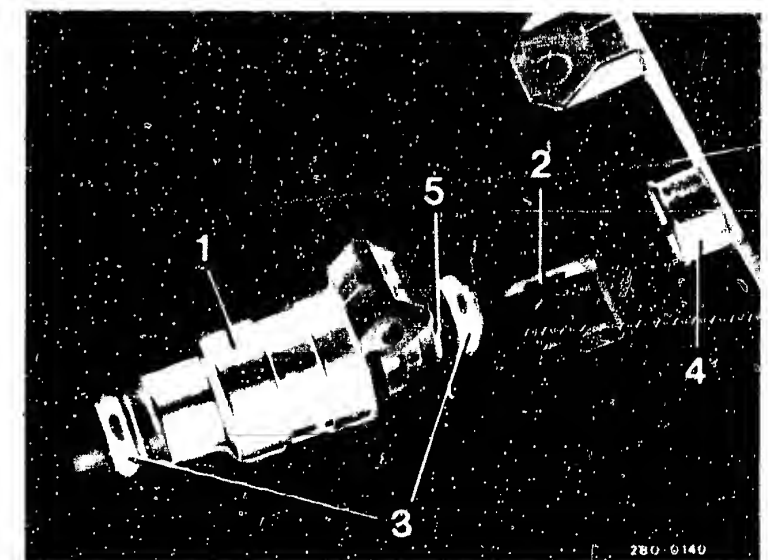
H6

Engine fails to start
Porsche 911 Carrera



- 1 = Solenoid-operated injection valve
- 2 = Fuel-distribution pipe
- 3 = Connection to start valve
- 4 = Mounting bracket
- 5 = Protection sleeve

- 1 = Solenoid-operated injection valve
- 2 = Holding clamp
- 3 = Rubber seal
- 4 = Fuel-distribution pipe connection
- 5 = Groove



Starting motor operates, engine fails to start or starts only with great difficulty (con.)

yes

Is idle actuator mechanically O.K.?

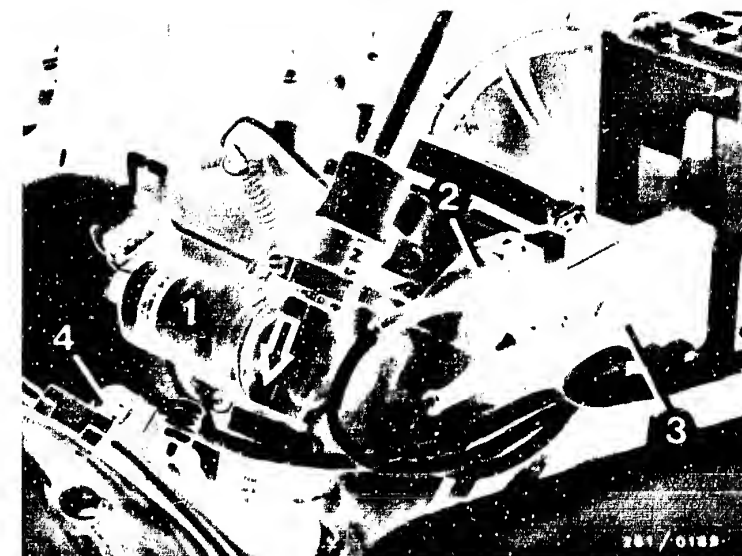
no

The idle actuator is tested electrically using the universal test adapter. Mechanically, the rotary slider in the idle actuator must be checked as follows for ease of movement:

Take out the idle actuator, disconnect the plug. Connect the center connection No. 4 to battery voltage. Connect the outer connection No. 3 to ground. By visual inspection, check whether the rotary slider turns to the end stop. Replace the outer connection, i.e., connect No. 5 to ground. The rotary slider must now turn to the opposite end stop. Take out and replace defective idle actuator. When installing the idle actuator, watch the direction of flow through it (arrow).

yes

Continued on H9/H10



- 1 = Idle actuator
- 2 = Plug connection for microswitch (idle contact)
- 3 = Throttle valve switch (full-load contact only)
- Arrow = Direction of flow

H7

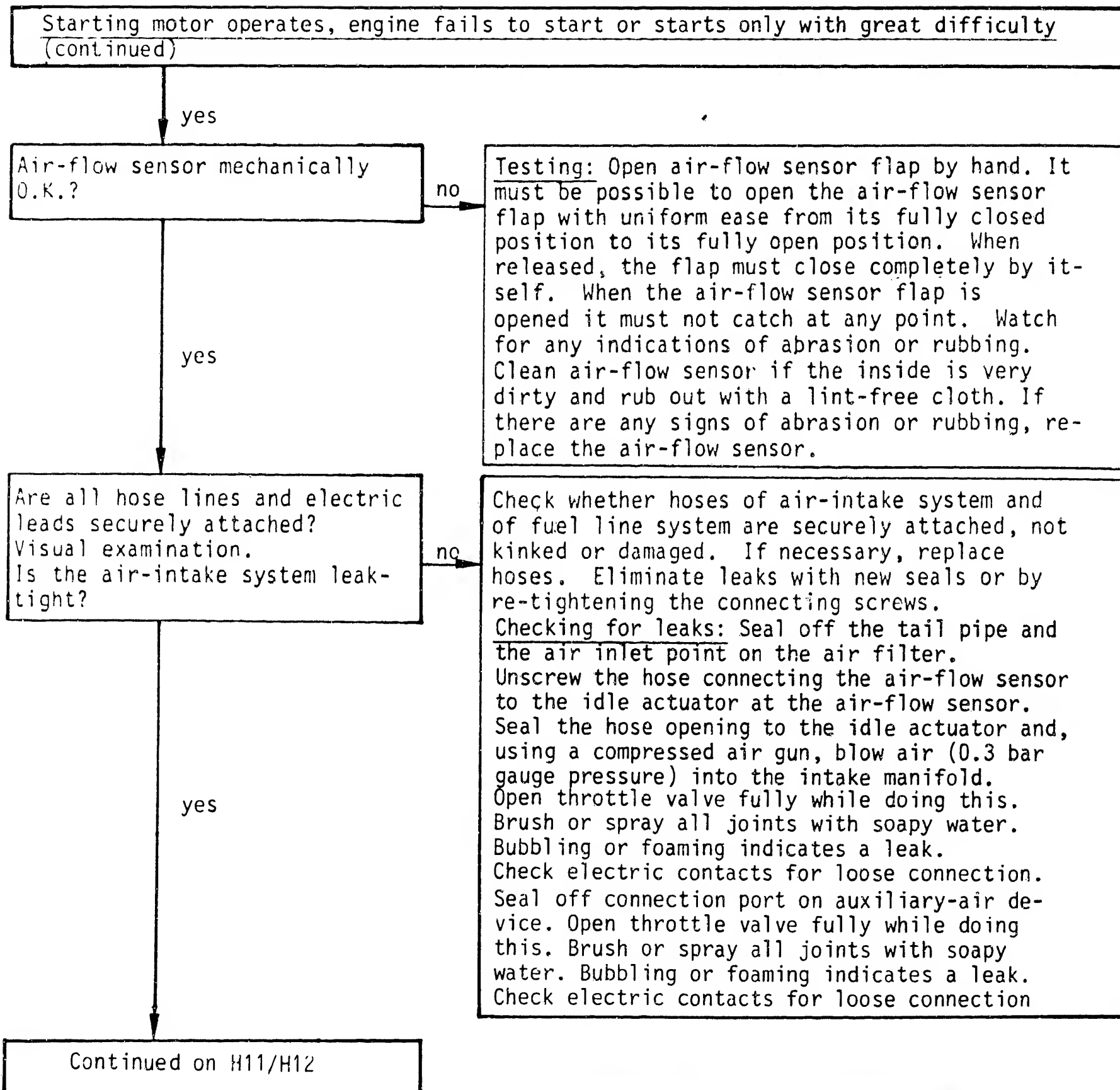
Engine fails to start
Porsche 911 Carrera



H8

Engine fails to start
Porsche 911 Carrera





- 1 = Airflow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

H9

Engine fails to start
Porsche 911 Carrera



H10

Engine fails to start
Porsche 911 Carrera



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Testing completed for customer complaint

"Starting motor operates, engine fails to start or starts only with great difficulty",

Customer complaint remedied?

no

Further possibilities

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not be detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).

H11

Engine fails to start
Porsche 911 Carrera



H12

Engine fails to start
Porsche 911 Carrera



ENGINE STARTS BUT THEN DIES

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

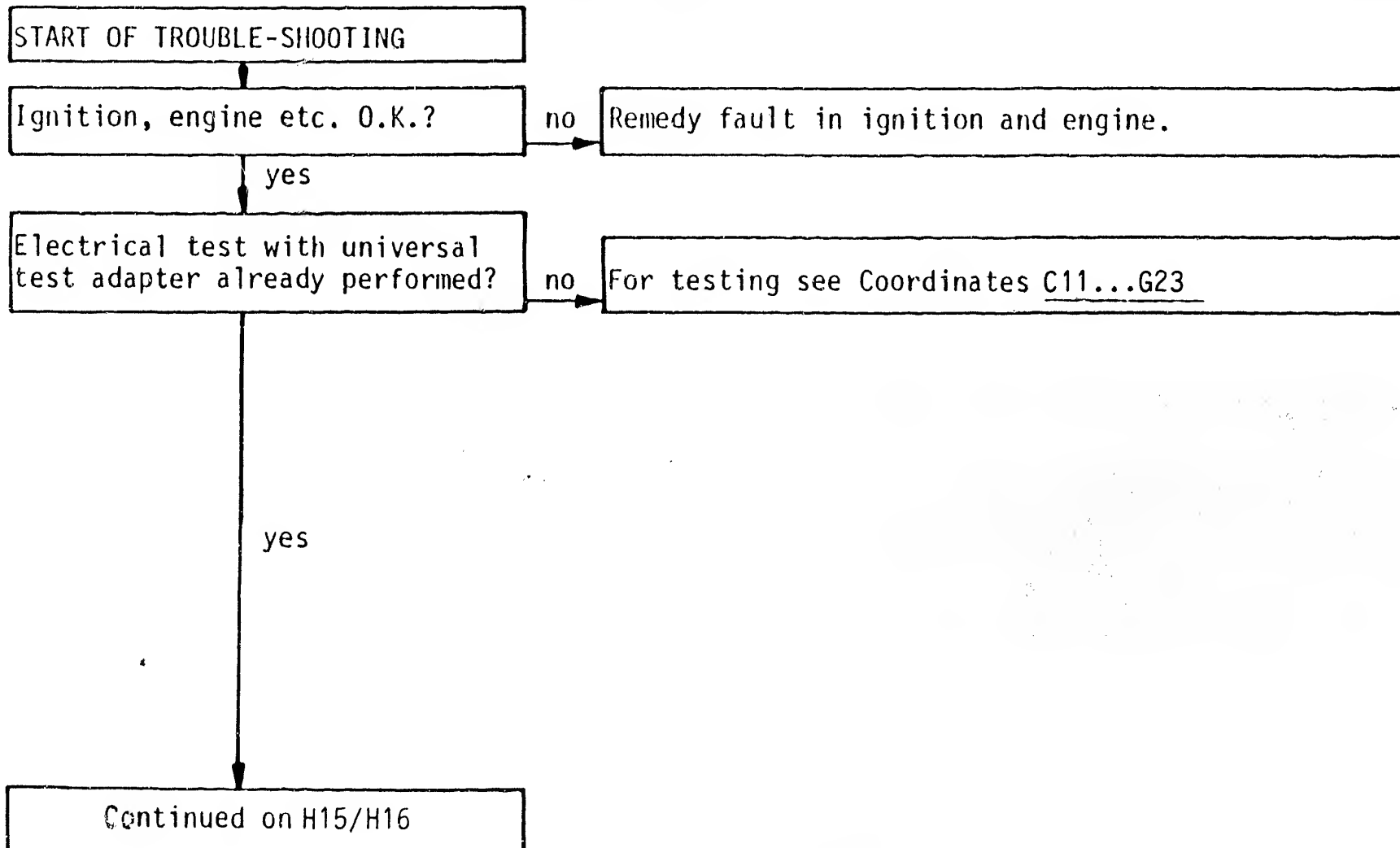
The program is divided into three rows of boxes:

- The left-hand row contains the questions on the tests.
- The middle row contains descriptions of the testing and adjustment operations on the components.
- The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



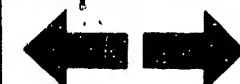
H13

Engine starts but then dies
Porsche 911 Carrera



H14

Engine starts but then dies
Porsche 911 Carrera



Engine starts but then dies (continued)

yes

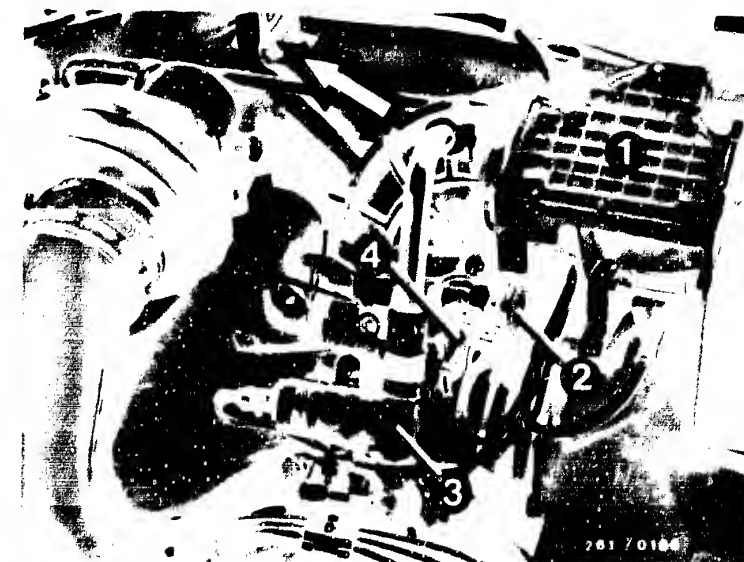
Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks: Seal off the tail pipe and the air inlet point on the air filter.
Unscrew the hose connecting the air-flow sensor to the idle actuator at the air-flow sensor. Seal the hose opening to the idle actuator and, using a compressed air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection

yes

Continued on H17/H18



- 1 = Airflow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

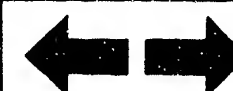
H15

Engine starts but then dies
Porsche 911 Carrera



H16

Engine starts but then dies
Porsche 911 Carrera



Engine starts but then dies (continued)

yes

Is idle actuator mechanically O.K.?

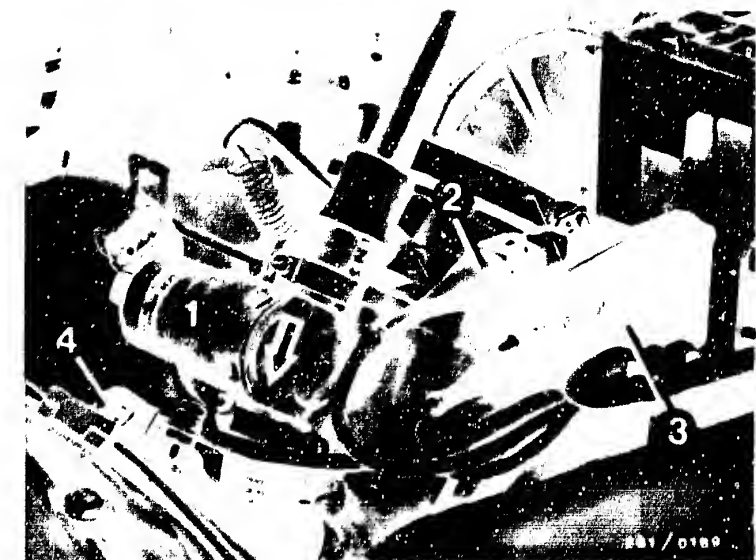
no

The idle actuator is tested electrically using the universal test adapter. Mechanically, the rotary slider in the idle actuator must be checked as follows for ease of movement:

Take out the idle actuator, disconnect the plug. Connect the center connection No. 4 to battery voltage. Connect the outer connection No. 3 to ground. By visual inspection, check whether the rotary slider turns to the end stop. Replace the outer connection, i.e., connect No. 5 to ground. The rotary slider must now turn to the opposite end stop. Take out and replace defective idle actuator. When installing the idle actuator, watch the direction of flow through it (arrow).

yes

Continued on H19/H20



- 1 = Idle actuator
- 2 = Plug connection for microswitch (idle contact)
- 3 = Throttle valve switch (full-load contact only)
- Arrow = Direction of flow

H17

Engine starts but then dies
Porsche 911 Carrera



H18

Engine starts but then dies
Porsche 911 Carrera



Engine starts but then dies (continued)

yes

Air-flow sensor O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

yes

Testing completed for customer complaint

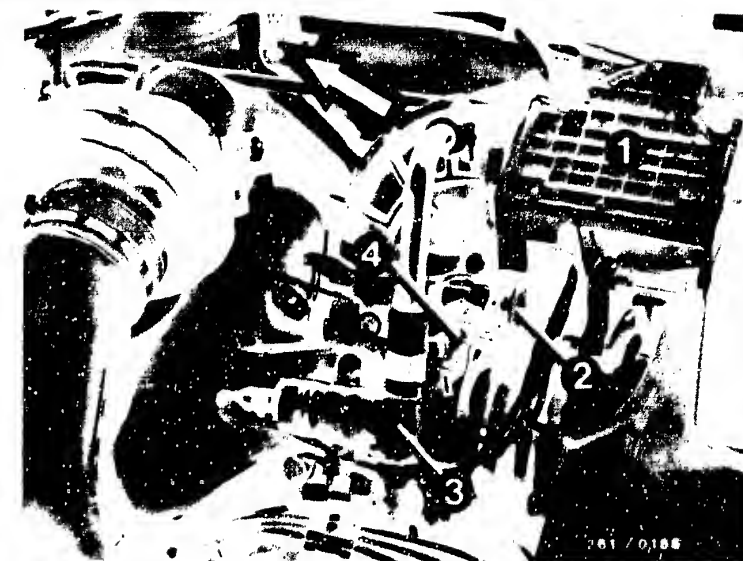
"Engine starts but then dies".

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Airflow sensor
2 = Throttle valve switch
3 = Idle actuator
4 = Connection from microswitch

H19

Engine starts but then dies
Porsche 911 Carrera



H20

Engine starts but then dies
Porsche 911 Carrera



UNEVEN ENGINE IDLE, ENGINE-SPEED ADJUSTMENT (IDLE) AND EXHAUST-GAS ADJUSTMENT

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

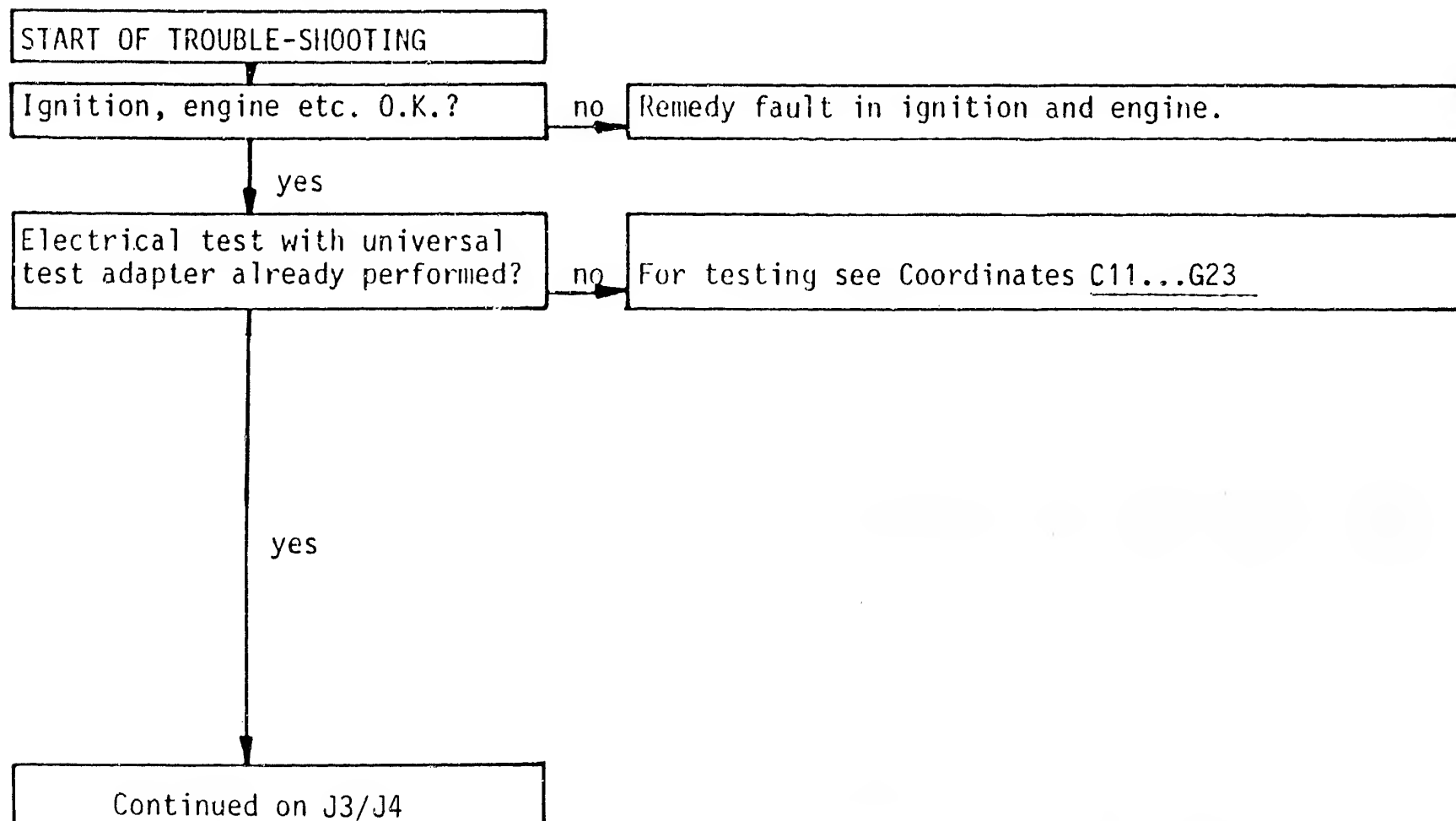
The program is divided into three rows of boxes:

- The left-hand row contains the questions on the tests.
- The middle row contains descriptions of the testing and adjustment operations on the components.
- The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



J1

Uneven engine idle
Porsche 911 Carrera



J2

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check the ignition coil and the high voltage distributor: Check the distributor cap on the inside and out for dirt and burnt channels. Check that the rotor guides (flyweights) move freely.

Instructions:

Turn the engine with cylinder 1 to TDC. Adjust the distributor in such a way that the center of the rotor points to the notch on the distributor housing. Adjust the distributor with the long slot by twisting the housing. Engines where a distributor with a long slot has been installed must be given a replacement distributor with a long slot (The new model has only a hole).

When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx. 0Ω). Secondary resistance: 5 to 7.2 k Ω . Check interference-suppression resistors, H.T. ignition cables and spark plugs. Interference-suppression in:

Ignition distributor rotor:	1 k Ω
Ignition distributor - outer dome:	1 k Ω
Ignition distributor - center dome:	1 k Ω
Spark plug suppressors:	3 k Ω

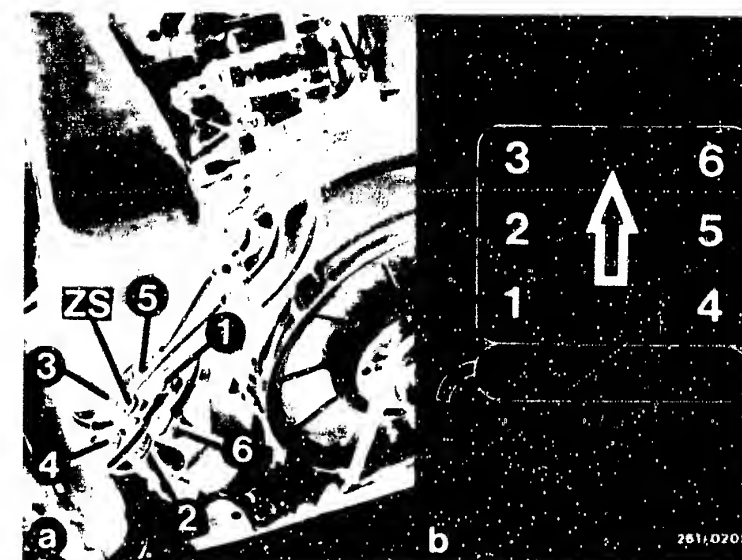
yes

Air-flow sensor O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

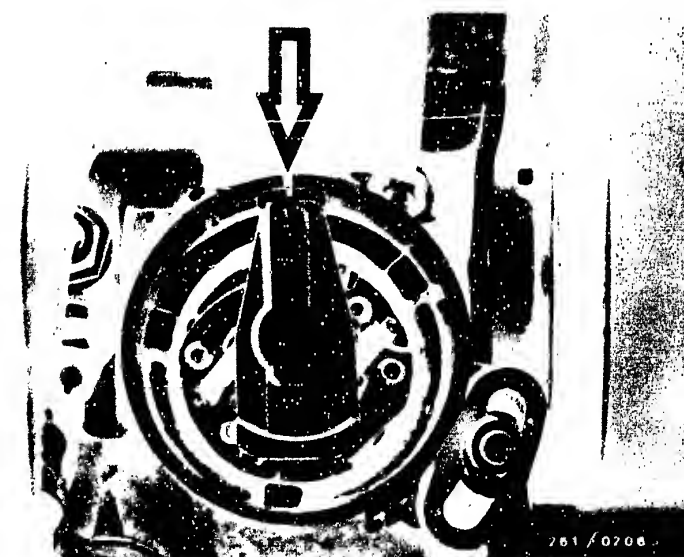
Continued on J5/J6



a = High voltage distributor
(turn to right)
1 to 6 = cylinder numbers
ZS = High voltage lead to
ignition coil

b = Arrangement of cylinders
(looking in direction of forward
vehicle travel)

Arrow = Center of distributor rotor
on housing marking



J3

Uneven engine idle
Porsche 911 Carrera



J4

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment
(continued)

yes

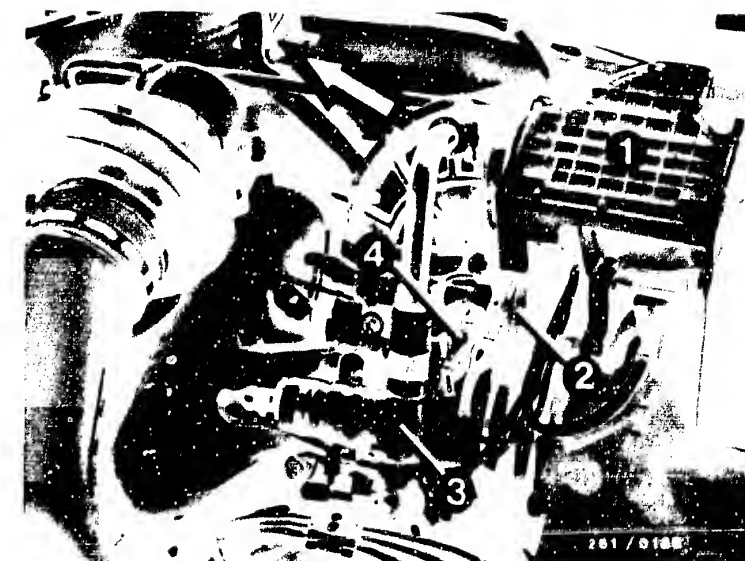
Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks: Seal off the tail pipe and the air inlet point on the air filter.
Unscrew the hose connecting the air-flow sensor to the idle actuator at the air-flow sensor. Seal the hose opening to the idle actuator and, using a compressed air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection

yes

Continued on J7/J8



- 1 = Airflow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

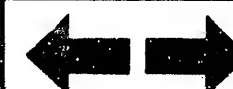
J5

Uneven engine idle
Porsche 911 Carrera



J6

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

yes

Is idle actuator mechanically O.K.?

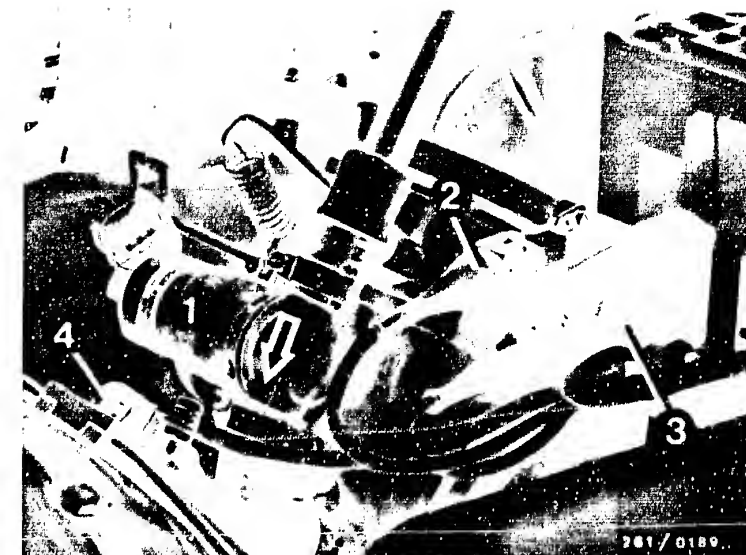
no

The idle actuator is tested electrically using the universal test adapter. Mechanically, the rotary slider in the idle actuator must be checked as follows for ease of movement:

Take out the idle actuator, disconnect the plug. Connect the center connection No. 4 to battery voltage. Connect the outer connection No. 3 to ground. By visual inspection, check whether the rotary slider turns to the end stop. Replace the outer connection, i.e., connect No. 5 to ground. The rotary slider must now turn to the opposite end stop. Take out and replace defective idle actuator. When installing the idle actuator, watch the direction of flow through it (arrow).

yes

Continued on J9/J10



- 1 = Idle actuator
- 2 = Plug connection for microswitch (idle contact)
- 3 = Throttle valve switch (full-load contact only)
- Arrow = Direction of flow

J7

Uneven engine idle
Porsche 911 Carrera



J8

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

yes

Solenoid-operated injection valve mechanically O.K.?

no

yes

With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is O.K.. If not, replace injection valve.

Removing the solenoid-operated injection valves

Loosen the fastening screws on the fuel-distribution pipe. Pull the fuel-distribution pipe upward until the injection valves are out of the bore in the intake manifold. Do not damage the nozzle needle or rubber seal.

Check the nozzle needle and surrounding area for leaks and deposits.

Remove the electrical connector.

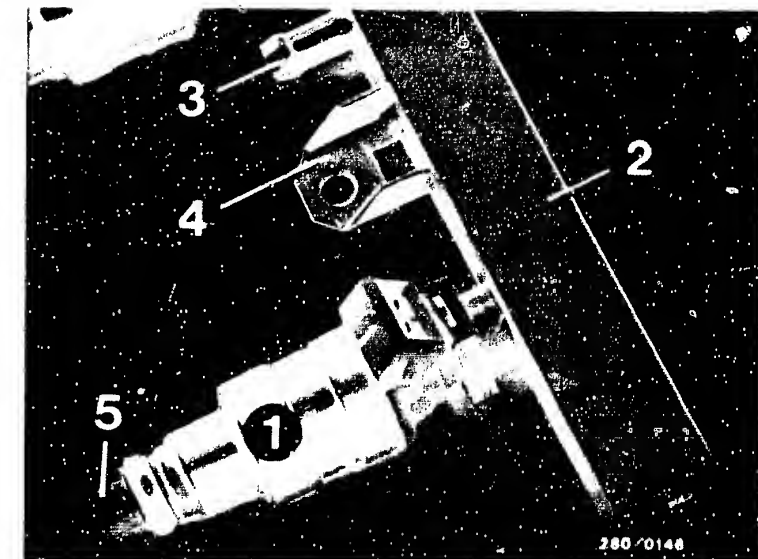
Carefully slide the holding clamps out of the groove and pull the injection valve out of the fuel distribution pipe connection.

Installing the solenoid-operated injection valves

Replace the seals. Press on a new protection sleeve (contained in repair kit) so that the nozzle needle is not damaged.

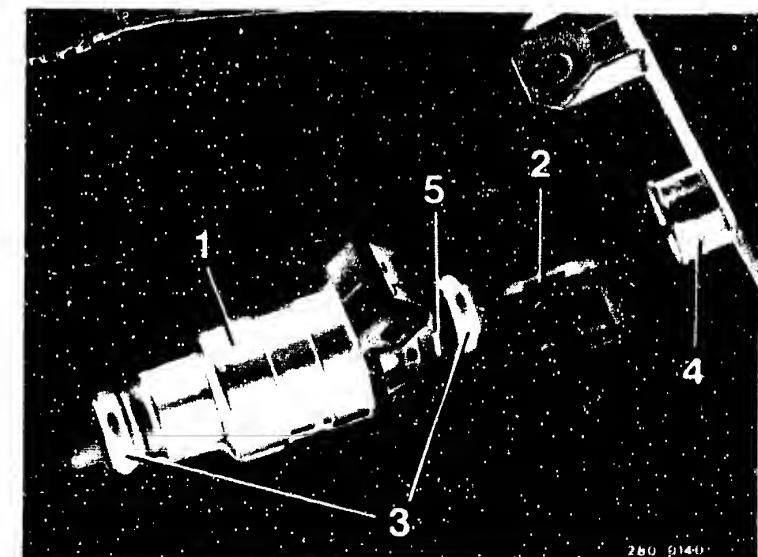
Check that both rubber seals are correctly seated. Press all 4 injection valves simultaneously into their seats with the fuel-distribution pipe. Secure the fuel-distribution pipe. Check all air and fuel hoses for security. Make the electrical connections.

Start the engine and check whether any unmetered air is being drawn in.



- 1 = Solenoid-operated injection valve
- 2 = Fuel-distribution pipe
- 3 = Connection to start valve
- 4 = Mounting bracket
- 5 = Protection sleeve

- 1 = Solenoid-operated injection valve
- 2 = Holding clamp
- 3 = Rubber seal
- 4 = Fuel-distribution pipe connection
- 5 = Groove



Continued on J11/J12

J9

Uneven engine idle
Porsche 911 Carrera



J10

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Is the CO-value O.K.?

- Test specification:
1.0 ... 1.5 vol. % CO
- S/CH/AUS:
0.5 ... 1.0 vol. % CO
- USA/Japan:
0.6 ... 1.0 vol. % CO

no

Follow the sequence.

- First measure the CO.
Conditions: Engine at normal operating temperature, load devices switched off, ambient temperature 15°C ... 35°C.

Do the adjustment as quickly as possible so that the intake paths do not overheat, thereby distorting the CO-reading.

- Adjust the exhaust gas using the idle-mixture-adjusting screw in the air-flow sensor. To do that, remove the plug. For USA/Japan vehicles, use special tools.

CO-value: 1.0 ... 1.5 vol. % CO
S/CH/AUS: 0.5 ... 1.0 vol. % CO

If CO cannot be adjusted:

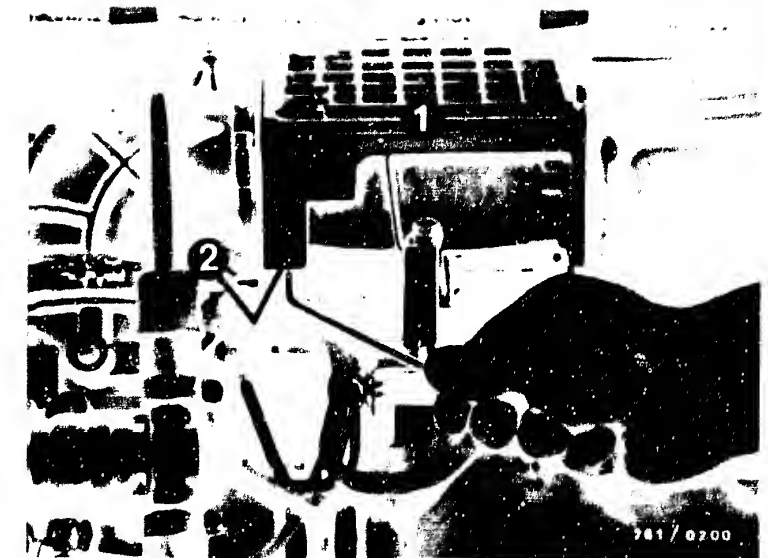
- CO-value too low: repeat check for leaks on the intake system.
- CO-value too high: take out and replace the air-flow sensor.

Note: After adjustment of the CO, put a new plug in the air-flow sensor.

yes

Continued on J15/J16

Continued on J13/J14



1 = Air-flow sensor

2 = Idle-mixture-adjusting screw

J11

Uneven engine idle
Porsche 911 Carrera



J12

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

- USA/Japan models:
Measure the CO-value before the catalytic converter.
Take apart the lambda sensor plug.
- Test specification: 0.6 ... 1.0 vol. % CO
- If CO cannot be adjusted:
- CO-value too low: repeat test for leaks on the intake system.
 - CO-value too high: take out and replace the air-flow sensor.
- Note: After adjustment of CO, put a new plug into the air-flow sensor.

yes

Continued on J15/J16



Arrow = Exhaust gas test fitting before the catalytic converter

- 1 = Plug connection from the lambda sensor
2 = Plug connection from the lambda sensor heater



J13

Uneven engine idle
Porsche 911 Carrera



J14

Uneven engine idle
Porsche 911 Carrera



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Is the idle speed O.K.?

Test specification:

750 ... 850 min⁻¹

no

• Adjust idle speed

The idle speed control must be switched off as follows for testing and adjusting the idle speed:

At the test socket, connect Term. B and Term. C using a lead.

Adjust the idle speed at the idle-speed-adjusting screw in the throttle valve assembly.

Idle speed:

750 ... 850 min⁻¹

yes

Checking of the customer complaint

"Uneven engine idle"

completed.

Has the customer's complaint been corrected?

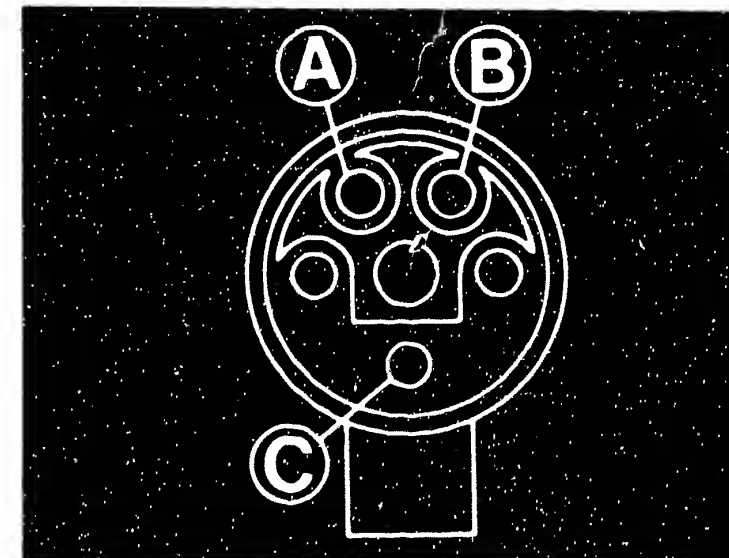
no

Further possible defects:

- Customer complaint incorrectly identified (see Coordinates C3 ... C 10).

If the defect was not identified with the "targeted trouble-shooting", see "detailed trouble-shooting" (coordinates C3/C4)

- The engine is not O.K. mechanically (compression, valve adjustment, valve control times, wear on camshafts).



Test socket on the left in the engine compartment on the engine electrical system plate

1 = Idle-speed-adjusting screw
2 = Idle actuator



J 15

Uneven engine idle
Porsche 911 Carrera



J 16

Uneven engine idle
Porsche 911 Carrera



POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

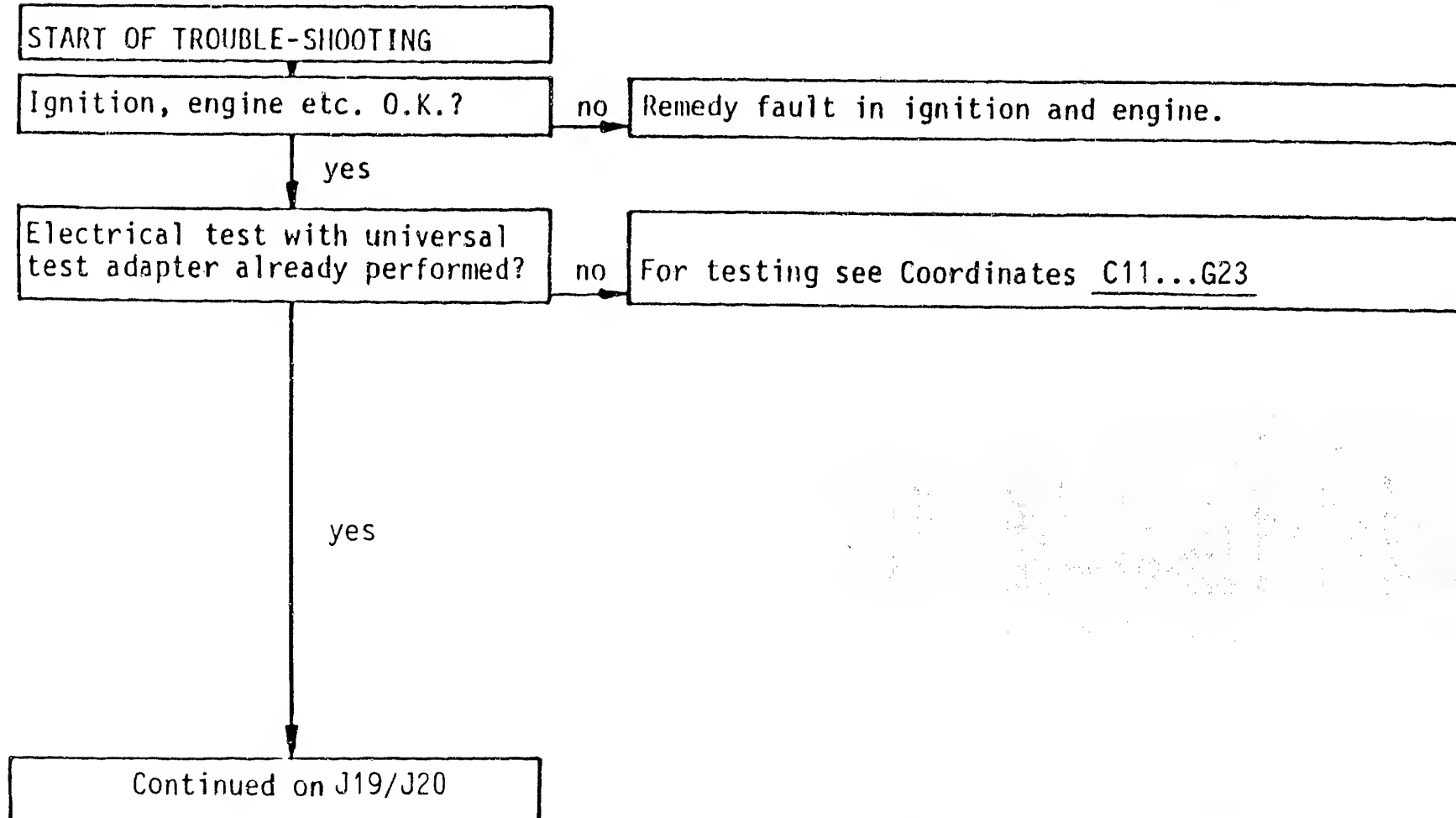
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- The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



J17

Poor throttle take-up
Porsche 911 Carrera



J18

Poor throttle take-up
Porsche 911 Carrera



Poor throttle take-up

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check the ignition coil and the high voltage distributor: Check the distributor cap on the inside and out for dirt and burnt channels. Check that the rotor guides (flyweights) move freely.

Instructions:

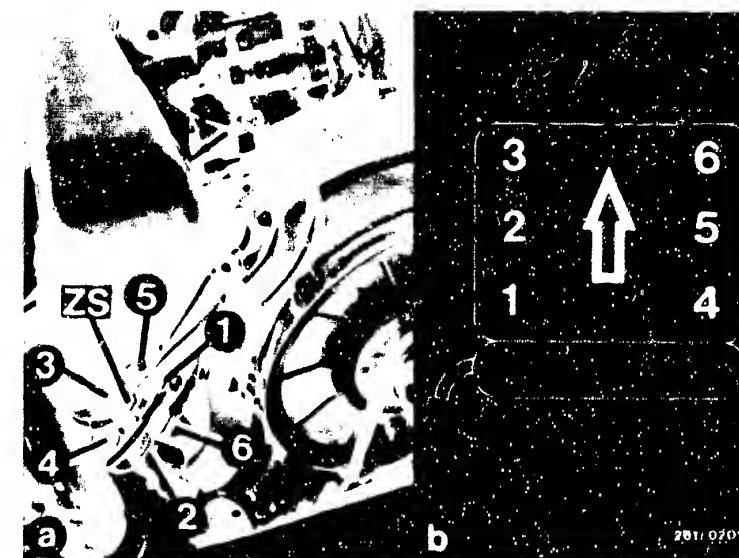
Turn the engine with cylinder 1 to TDC. Adjust the distributor in such a way that the center of the rotor points to the notch on the distributor housing. Adjust the distributor with the long slot by twisting the housing. Engines where a distributor with a long slot has been installed must be given a replacement distributor with a long slot (The new model has only a hole).

When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx. 0Ω). Secondary resistance: 5 to 7.2 k Ω . Check interference-suppression resistors, H.T. ignition cables and spark plugs. Interference-suppression in:

Ignition distributor rotor:	1 k Ω
Ignition distributor - outer dome:	1 k Ω
Ignition distributor - center dome:	1 k Ω
Spark plug suppressors:	3 k Ω

yes

Continued on J21/J22

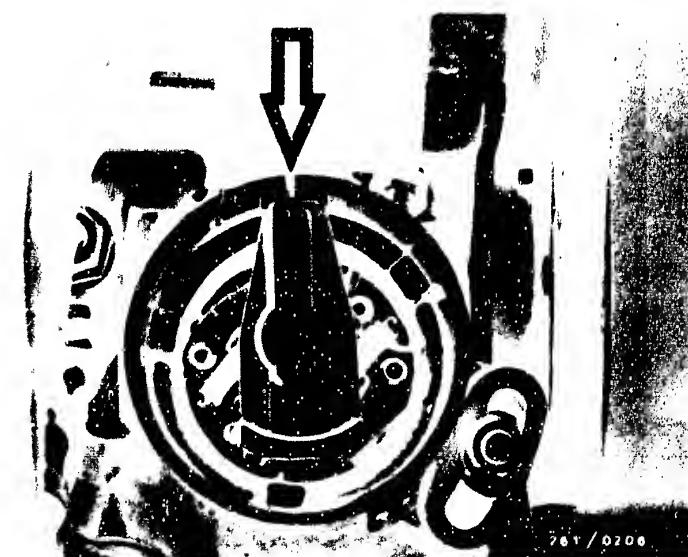


a = High voltage distributor
(turn to right)

1 to 6 = cylinder numbers
ZS = High voltage lead to
ignition coil

b = Arrangement of cylinders
(looking in direction of forward
vehicle travel)

Arrow = Center of distributor rotor
on housing marking



J19

Poor throttle take-up
Porsche 911 Carrera



J20

Poor throttle take-up
Porsche 911 Carrera



Poor throttle take-up (continued)

yes

Air-flow sensor mechanically O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

yes

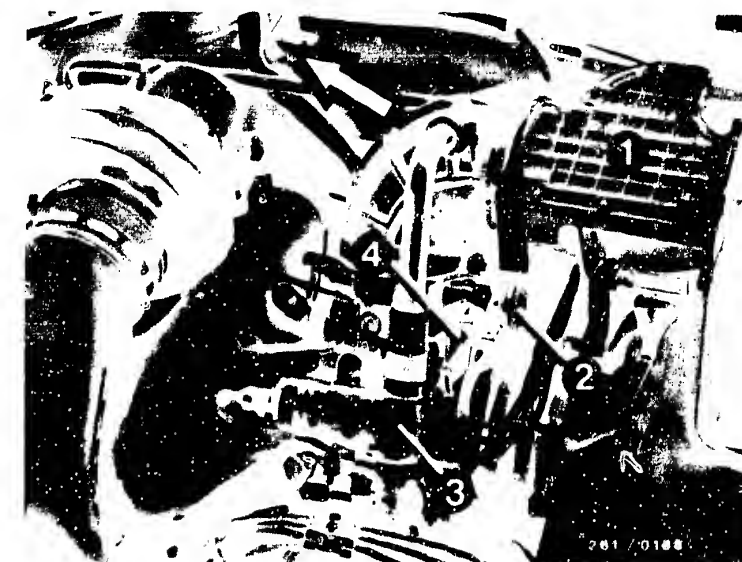
Are all hose lines and electric leads securely attached? Visual examination.
Is the air-intake system leak-tight?

no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks: Seal off the tail pipe and the air inlet point on the air filter. Unscrew the hose connecting the air-flow sensor to the idle actuator at the air-flow sensor. Seal the hose opening to the idle actuator and, using a compressed air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection

yes

Continued on J23/J24



- 1 = Airflow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

J21

Poor throttle take-up
Porsche 911 Carrera



J22

Poor throttle take-up
Porsche 911 Carrera



Poor throttle take-up (continued)

yes

Is idle actuator mechanically O.K.?

no

The idle actuator is tested electrically using the universal test adapter. Mechanically, the rotary slider in the idle actuator must be checked as follows for ease of movement:

Take out the idle actuator, disconnect the plug. Connect the center connection No. 4 to battery voltage. Connect the outer connection No. 3 to ground. By visual inspection, check whether the rotary slider turns to the end stop. Replace the outer connection, i.e., connect No. 5 to ground. The rotary slider must now turn to the opposite end stop. Take out and replace defective idle actuator. When installing the idle actuator, watch the direction of flow through it (arrow).

yes

Testing completed for customer complaint

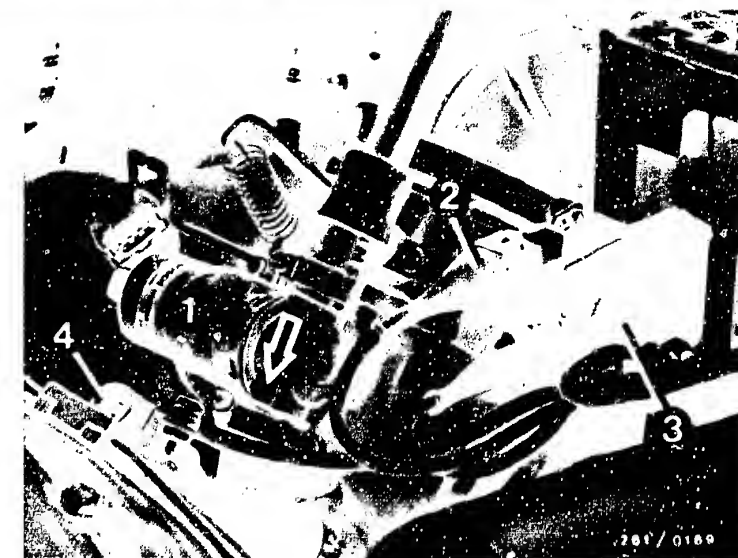
"Poor throttle take-up"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (See Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Idle actuator
2 = Plug connection for microswitch (idle contact)
3 = Throttle valve switch (full-load contact only)
Arrow = Direction of flow

J23

Poor throttle take-up
Porsche 911 Carrera



J24

Poor throttle take-up
Porsche 911 Carrera



ENGINE MISSING UNDER ALL OPERATING CONDITIONS

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

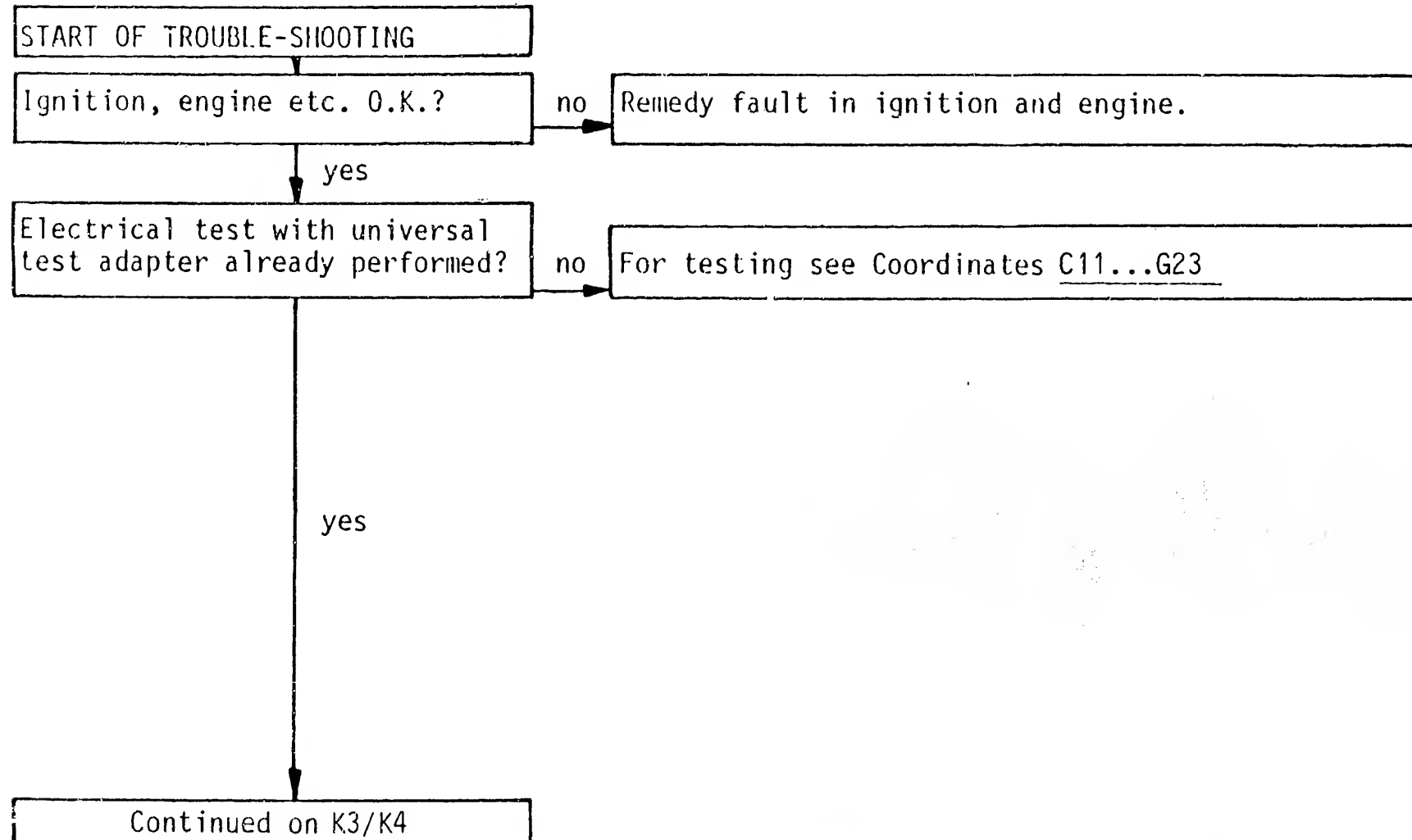
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- The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



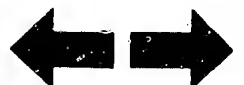
K1

Engine missing
Porsche 911 Carrera

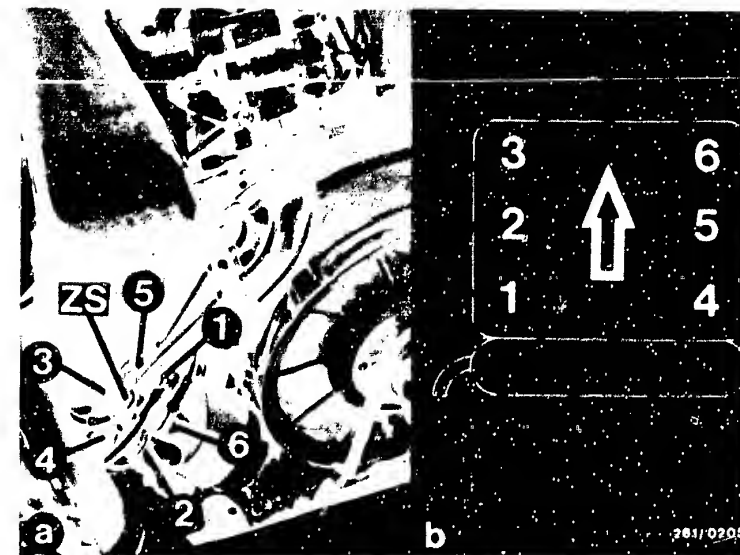
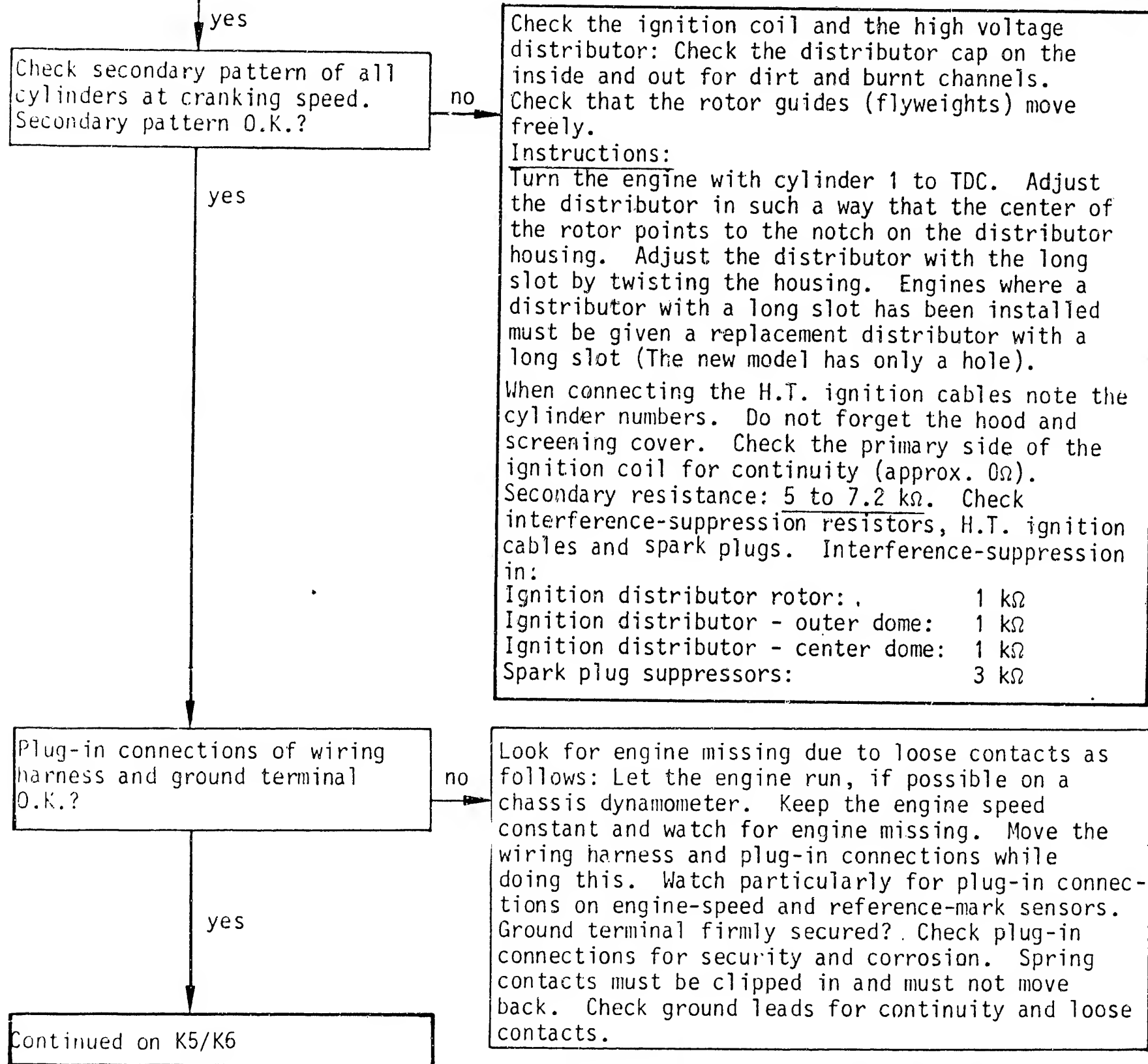


K2

Engine missing
Porsche 911 Carrera



Engine missing under all operating conditions (continued)



a = High voltage distributor (turn to right)

1 to 6 = cylinder numbers
ZS = High voltage lead to ignition coil

b = Arrangement of cylinders (looking in direction of forward vehicle travel)

Arrow = Center of distributor rotor on housing marking



K3

Engine missing
Porsche 911 Carrera



K4

Engine missing
Porsche 911 Carrera



Engine missing under all operating conditions (continued)

yes

Fuel delivery O.K. ?

no

Measuring fuel delivery:

To test, disconnect the fuel return hose at the distributor piece. In so doing hold with a wrench. Catch any fuel that runs out. Connect a test hose (consisting of 1.5 m low pressure hose NW 6, a 90° elbow nipple NW 6 with connecting thread M 14 x 1.5 and a 60° internal cone) to the distributor piece, and direct it into a 5 l container with a measuring scale. Switch on the fuel pump. On the Universal Test Adapter, set the program switch "V" to setting 17. Switch on the ignition, and press button T3.

Test specification: min. 950 cm³/30 s

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts; possibly also eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Is the filter in the tank clogged? Is there corrosion in the tank?

yes

Control unit O.K. ?

no

Let engine run. Shake control unit lightly and move multiple plug. Watch for engine missing. Restore plug-in connection on multiple plug or replace defective control unit.

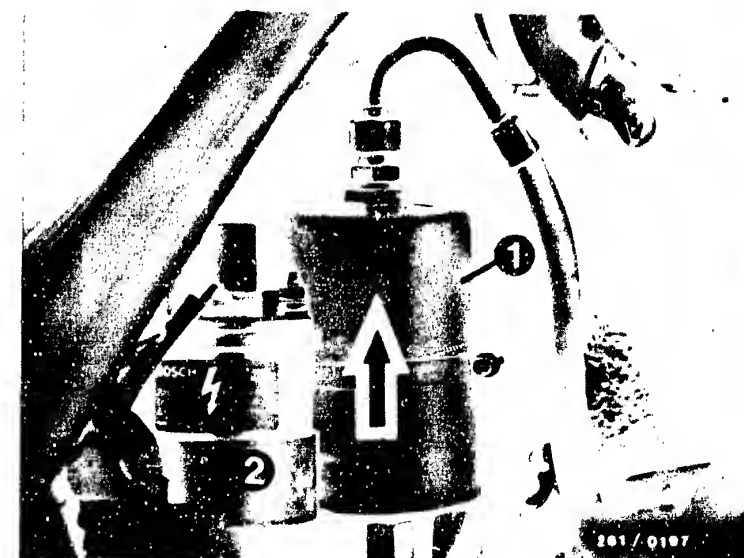
yes

Continued on K7/K8



Arrow = Connecting point for test hose

1 = Fuel filter
2 = Ignition coil
Arrow = Direction of flow



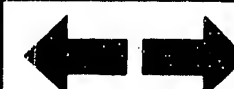
K5

Engine missing
Porsche 911 Carrera



K6

Engine missing
Porsche 911 Carrera



Engine missing under all operating conditions (continued)

yes

Air-flow sensor O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

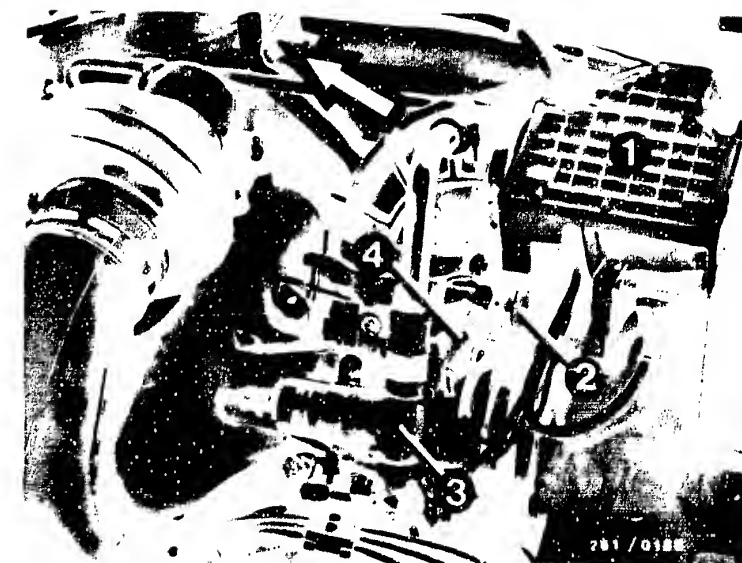
Potentiometer test (noise test)

Remove air-flow sensor. Leave plug on. Set the Motortester to "special inlet" and connect the air-flow sensor Term. 7 (2)* (red clip) and Term. 6 (4)* (black clip). Put the control lever for picture adjustment on the Motortester at the left stop (calibrated adjustment). Switch on the ignition. Deflect the air-flow sensor flap several times suddenly. If the air-flow sensor is good, a stroke signal without interruptions must be visible on the oscilloscope. If the air-flow sensor is defective, a noise signal similar to the illustration at the right appears. Take out and replace the air-flow sensor.

(*) = New identification markings on the air-flow sensor

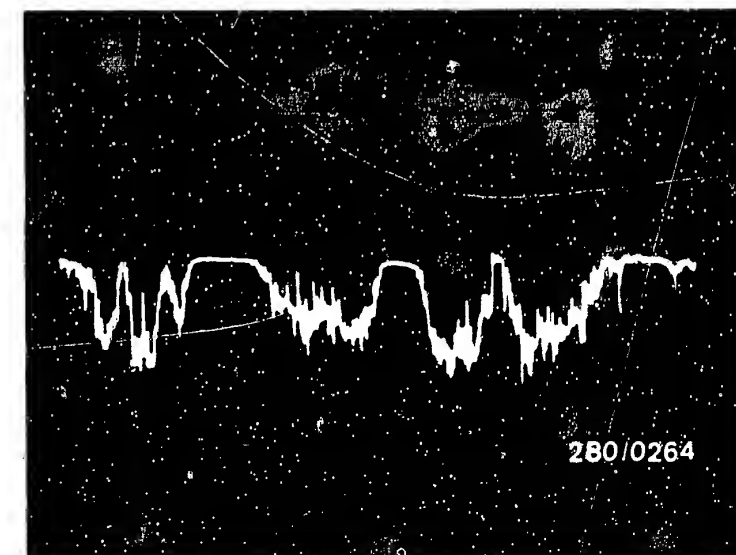
yes

Continued on K9/K10



- 1 = Air-flow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

Noise signal from defective air-flow sensor



K7

Engine missing
Porsche 911 Carrera

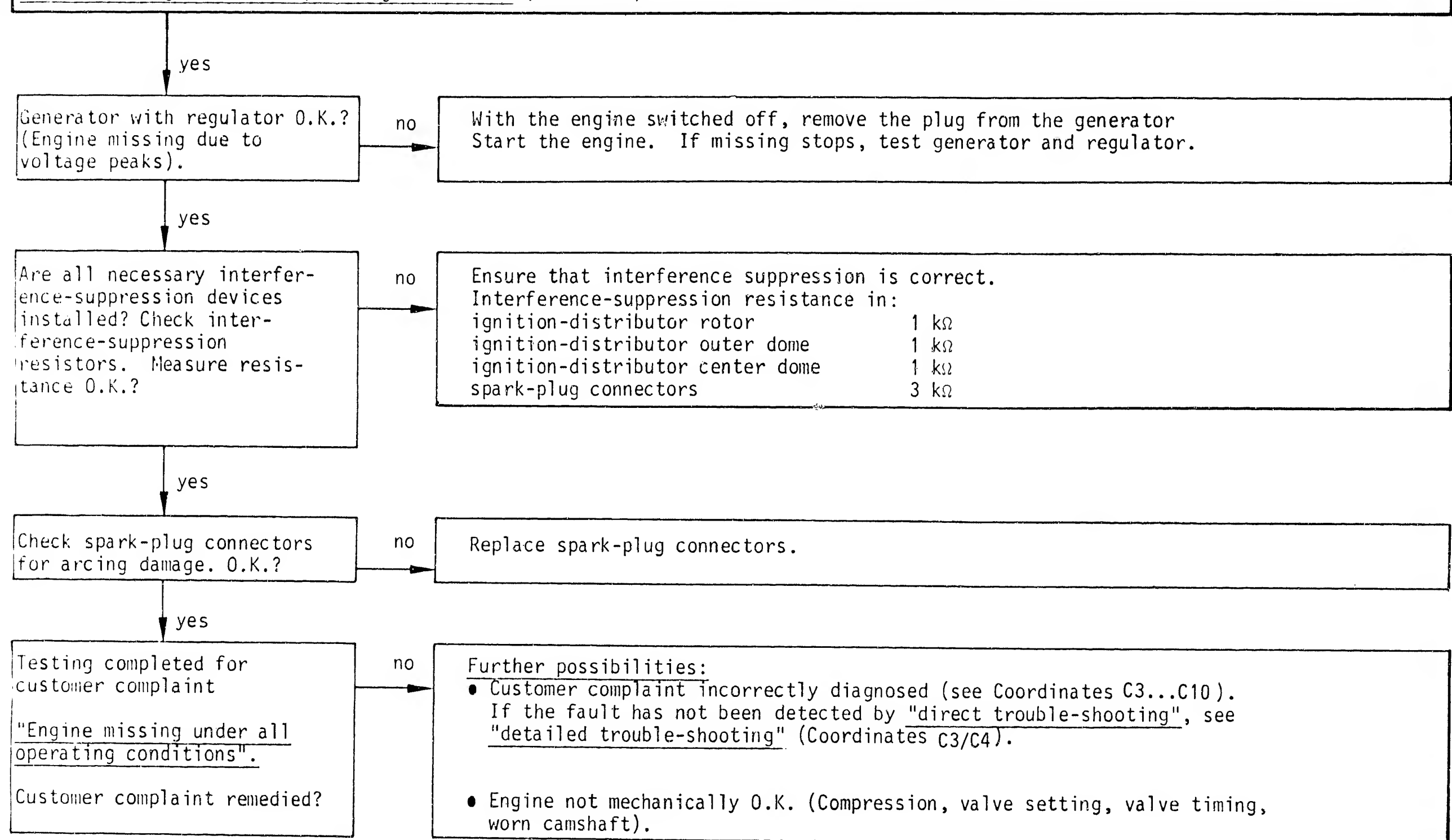


K8

Engine missing
Porsche 911 Carrera



Engine missing under all operating conditions (continued)



K9

Engine missing
Porsche 911 Carrera



K10

Engine missing
Porsche 911 Carrera



FUEL CONSUMPTION TOO HIGH

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

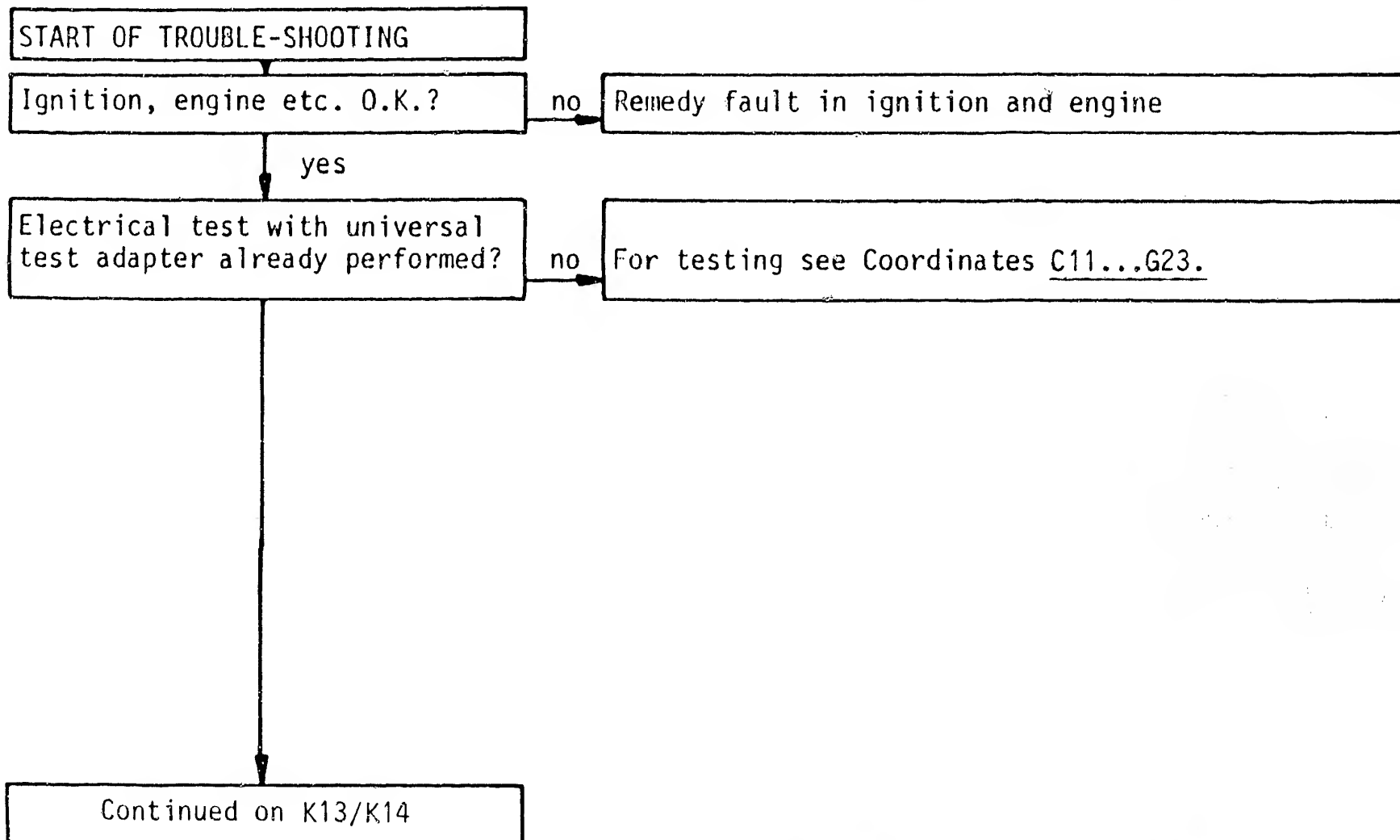
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If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



K11

Fuel consumption too high
Porsche 911 Carrera



K12

Fuel consumption too high
Porsche 911 Carrera



Fuel consumption too high (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check the ignition coil and the high voltage distributor: Check the distributor cap on the inside and out for dirt and burnt channels. Check that the rotor guides (flyweights) move freely.

Instructions:

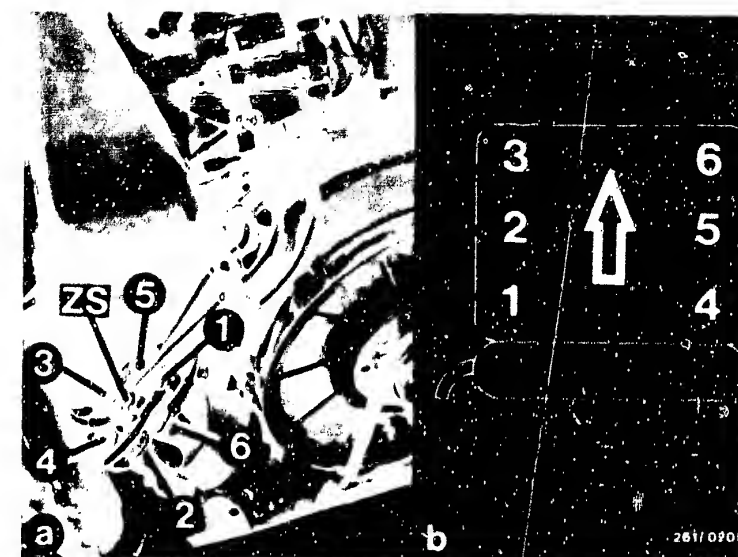
Turn the engine with cylinder 1 to TDC. Adjust the distributor in such a way that the center of the rotor points to the notch on the distributor housing. Adjust the distributor with the long slot by twisting the housing. Engines where a distributor with a long slot has been installed must be given a replacement distributor with a long slot (The new model has only a hole).

When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx. 0Ω). Secondary resistance: 5 to 7.2 k Ω . Check interference-suppression resistors, H.T. ignition cables and spark plugs. Interference-suppression in:

Ignition distributor rotor:	1 k Ω
Ignition distributor - outer dome:	0 k Ω
Ignition distributor - center dome:	0 k Ω
Spark plug suppressors:	3 k Ω
Ignition cable plug:	1 k Ω

yes

Continued on K15/K16



a = High voltage distributor (turn to right)

1 to 6 = cylinder numbers

ZS = High voltage lead to ignition coil

b = Arrangement of cylinders (looking in direction of forward vehicle travel)

Arrow = Center of distributor rotor on housing marking



K13

Fuel consumption too high
Porsche 911 Carrera

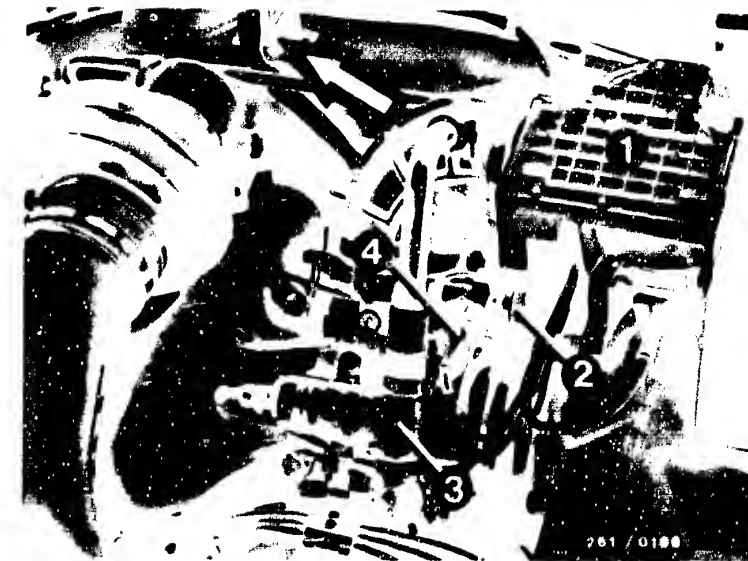
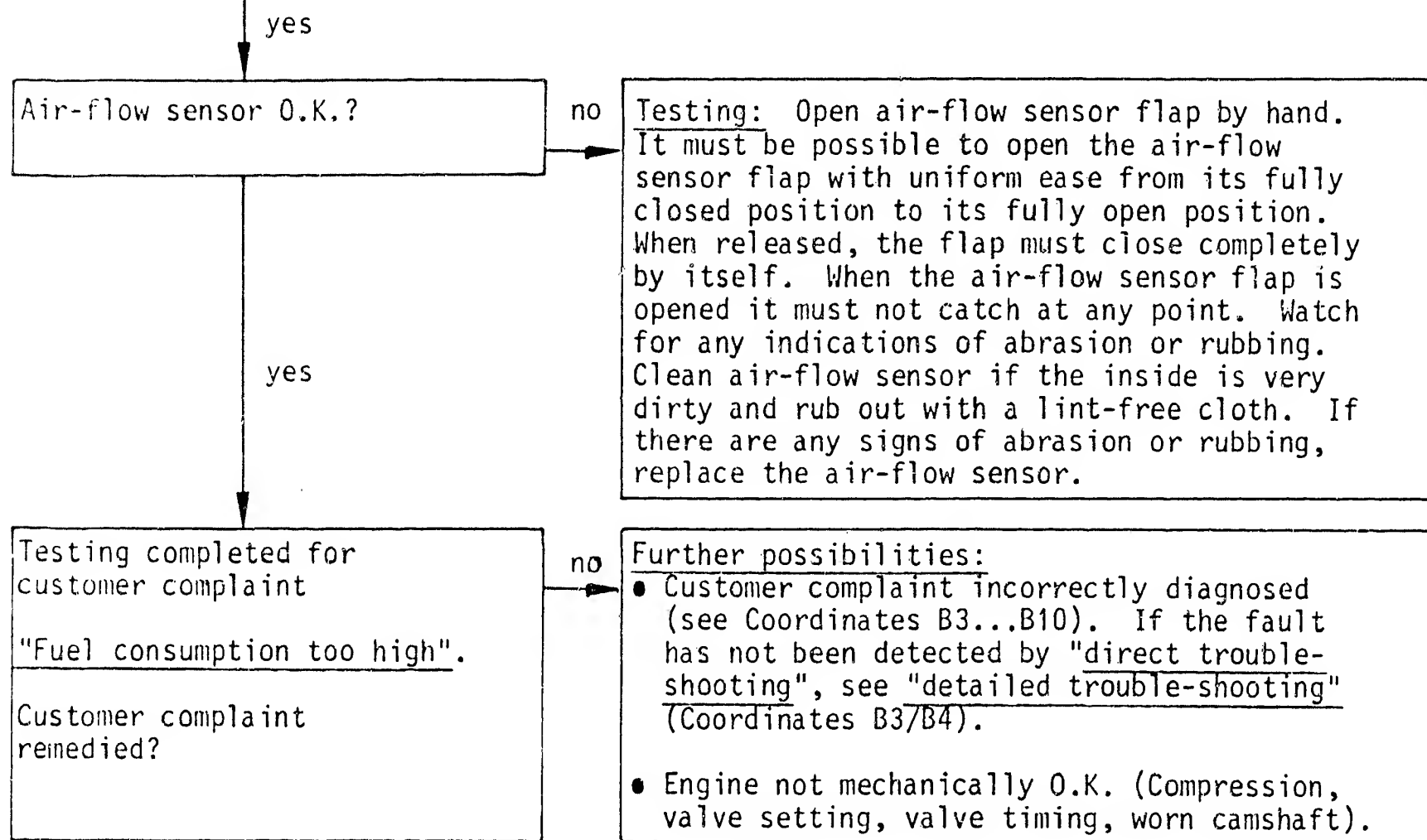


K14

Fuel consumption too high
Porsche 911 Carrera



Fuel consumption too high (continued)



- 1 = Air-flow sensor
2 = Throttle valve switch
3 = Idle actuator
4 = Connection from microswitch

K15

Fuel consumption too high
Porsche 911 Carrera



K16

Fuel consumption too high
Porsche 911 Carrera



NO MAXIMUM ENGINE POWER, TOP SPEED NOT REACHED

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

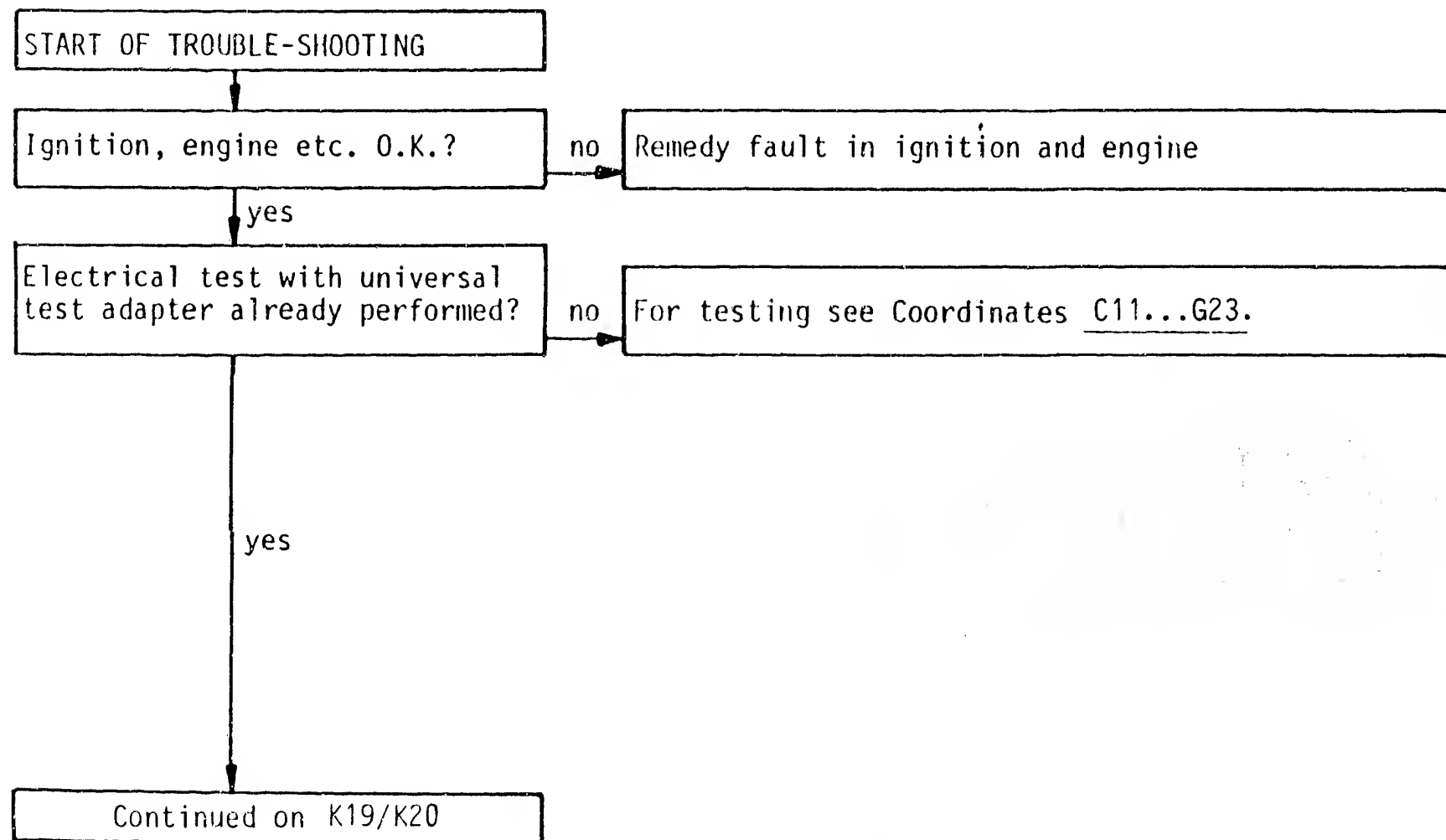
The program is divided into three rows of boxes:

- The left-hand row contains the questions on the tests.
- The middle row contains descriptions of the testing and adjustment operations on the components.
- The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



K17

No maximum engine power
Porsche 911 Carrera



K18

No maximum engine power
Porsche 911 Carrera



No maximum engine power / top speed not reached (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check the ignition coil and the high voltage distributor: Check the distributor cap on the inside and out for dirt and burnt channels. Check that the rotor guides (flyweights) move freely.

Instructions:

Turn the engine with cylinder 1 to TDC. Adjust the distributor in such a way that the center of the rotor points to the notch on the distributor housing. Adjust the distributor with the long slot by twisting the housing. Engines where a distributor with a long slot has been installed must be given a replacement distributor with a long slot (The new model has only a hole).

When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx. 0Ω). Secondary resistance: 5 to 7.2 k Ω . Check interference-suppression resistors, H.T. ignition cables and spark plugs. Interference-suppression in:

Ignition distributor rotor:	1 k Ω
Ignition distributor - outer dome:	1 k Ω
Ignition distributor - center dome:	1 k Ω
Spark plug suppressors:	3 k Ω

yes

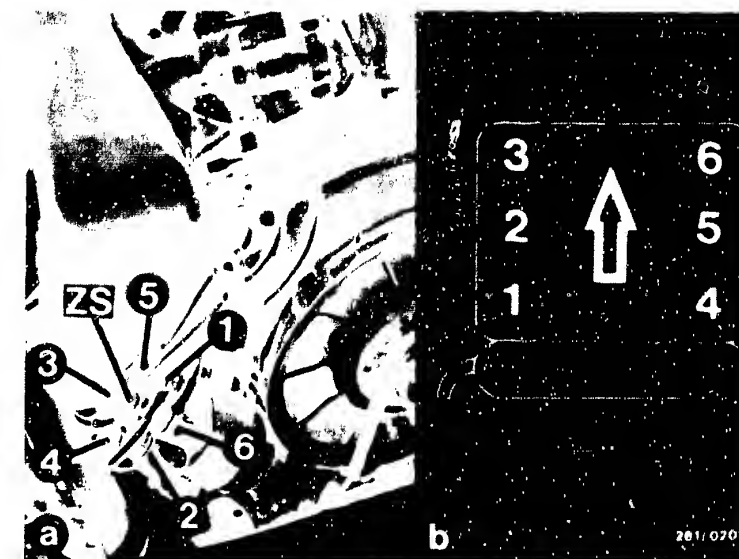
Does throttle valve open fully?

no

Are the accelerator linkage, accelerator pedal O.K.? If need be, adjust or straighten the linkage. The accelerator pedal can jam due to the floor mat, etc. The clearance of the long accelerator linkage must be 0.5 ... 1 mm at the gearshift lever, because otherwise the idle contact does not always switch over. To check this, press the lower lever lightly toward the back of the vehicle.

yes

Continued on K21/K22

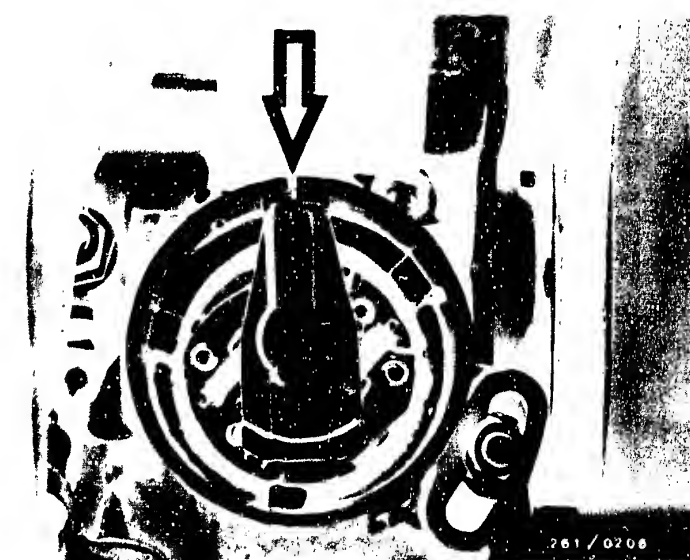


a = High voltage distributor (turn to right)

1 to 6 = cylinder numbers
ZS = High voltage lead to ignition coil

b = Arrangement of cylinders (looking in direction of forward vehicle travel)

Arrow = Center of distributor rotor on housing marking



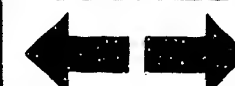
K19

No maximum engine power
Porsche 911 Carrera



K20

No maximum engine power
Porsche 911 Carrera



No maximum engine power / top speed not reached (continued)

yes

Fuel pressure at full load O.K.?

no

Test the fuel pressure on a chassis dynamometer at rated speed and rated power: Connect pressure gauge to test connection of fuel-distribution pipe.
Note: When opening the cap nut, pay attention to the fitted bearing.
Collect any fuel which runs out. Danger of fire with engine hot and with sparks.

Test specification at full load:

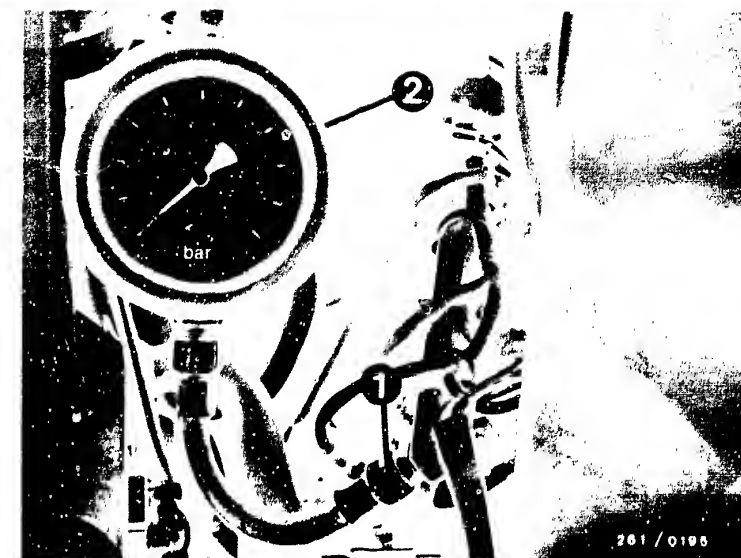
2.3...2.7 bar
(Reading may fluctuate slightly)

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts, possibly eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.
- Strainer in tank clogged? Corrosion in tank?

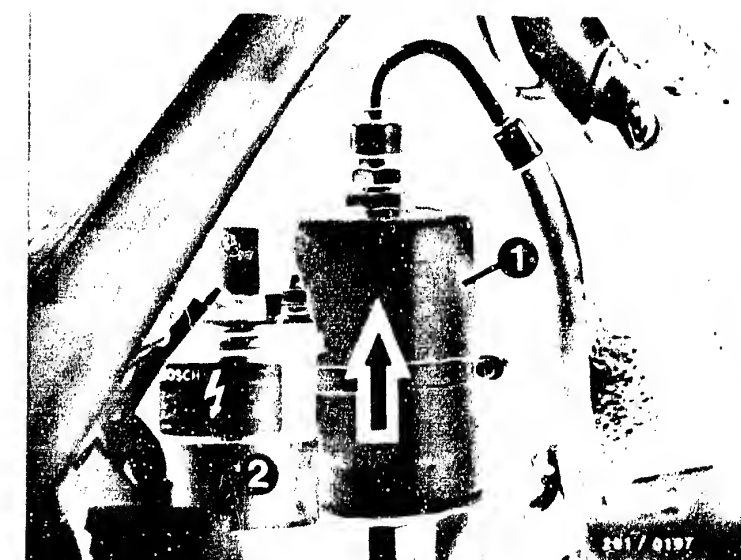
yes

Continued on K23/K24



1 = Test connection
2 = Pressure gauge

1 = Fuel filter
2 = Ignition coil
Arrow = Direction of flow



K21

No maximum engine power
Porsche 911 Carrera



K22

No maximum engine power
Porsche 911 Carrera



No maximum engine power / top speed not reached (continued)

yes

Air-flow sensor O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully close position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

yes

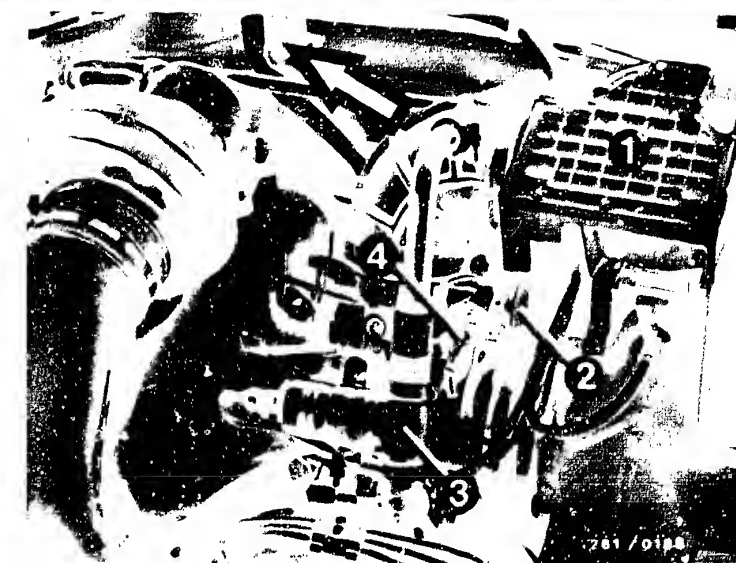
Air intake clear?

no

• Air filter clogged.

yes

Continued on L1/L2



- 1 = Air-flow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

K23

No maximum engine power
Porsche 911 Carrera



K24

No maximum engine power
Porsche 911 Carrera



No maximum engine power / top speed not reached (continued)

yes

Fuel delivery O.K. ?

no

Measuring fuel delivery:

To test, disconnect the fuel return hose at the distributor piece. In so doing hold with a wrench. Catch any fuel that runs out. Connect a test hose (consisting of 1.5 m low pressure hose NW 6, a 90° elbow nipple NW 6 with connecting thread M 14 x 1.5 and a 60° internal cone) to the distributor piece, and direct it into a 5 l container with a measuring scale. Switch on the fuel pump. On the Universal Test Adapter, set the program switch "V" to setting 17. Switch on the ignition, and press button T3.

Test specification: min. 950 cm³/30 s

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts; possibly also eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Is the filter in the tank clogged? Is there corrosion in the tank?

yes

Continued on L3/L4

L1

No maximum engine power
Porsche 911 Carrera



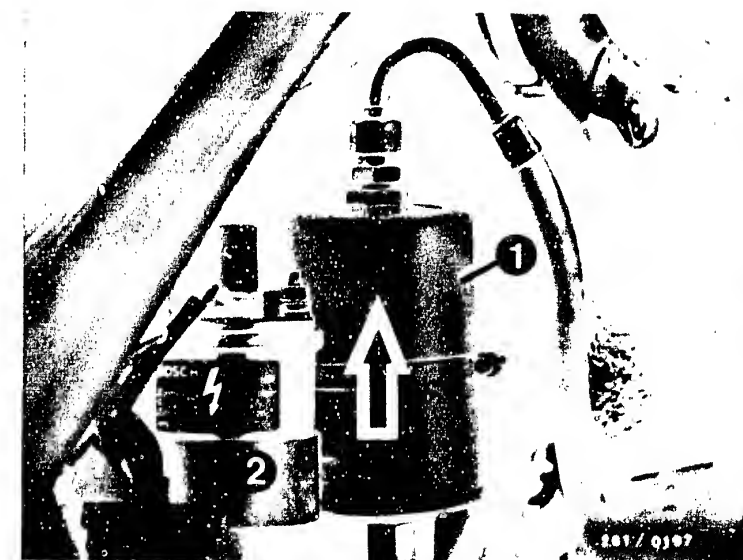
L2

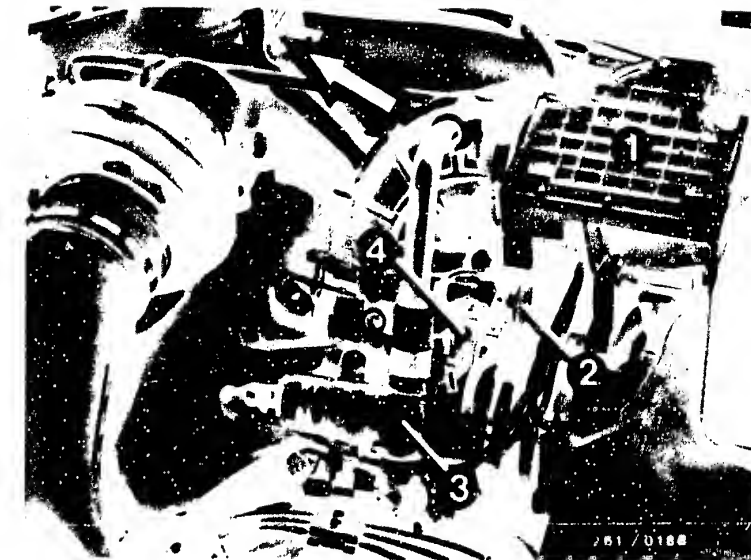
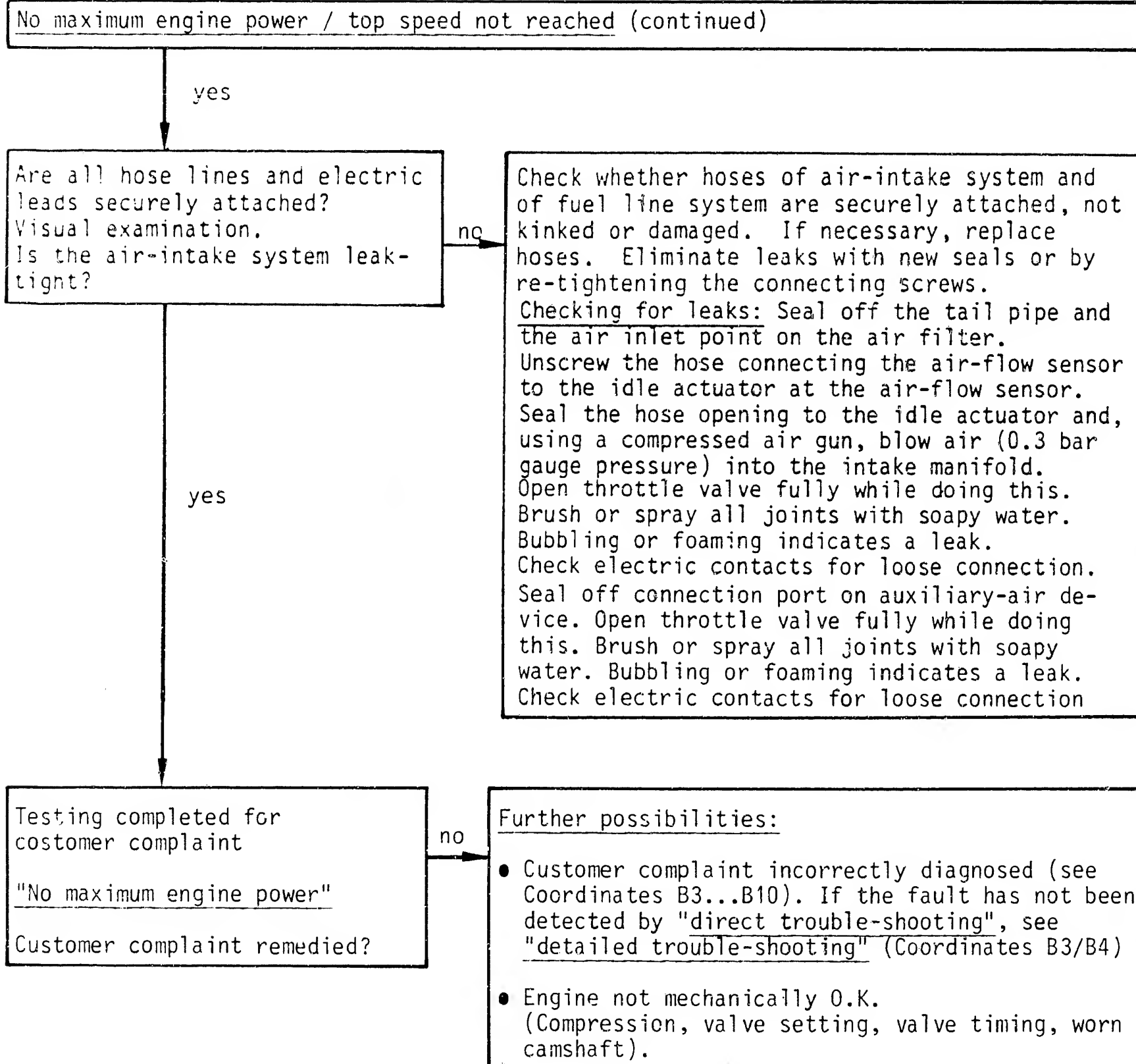
No maximum engine power
Porsche 911 Carrera



Arrow = Connecting point for test hose

1 = Fuel filter
2 = Ignition coil
Arrow = Direction of flow





- 1 = Airflow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

L3

No maximum engine power
Porsche 911 Carrera



L4

No maximum engine power
Porsche 911 Carrera



CO-ADJUSTMENT AT IDLE TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

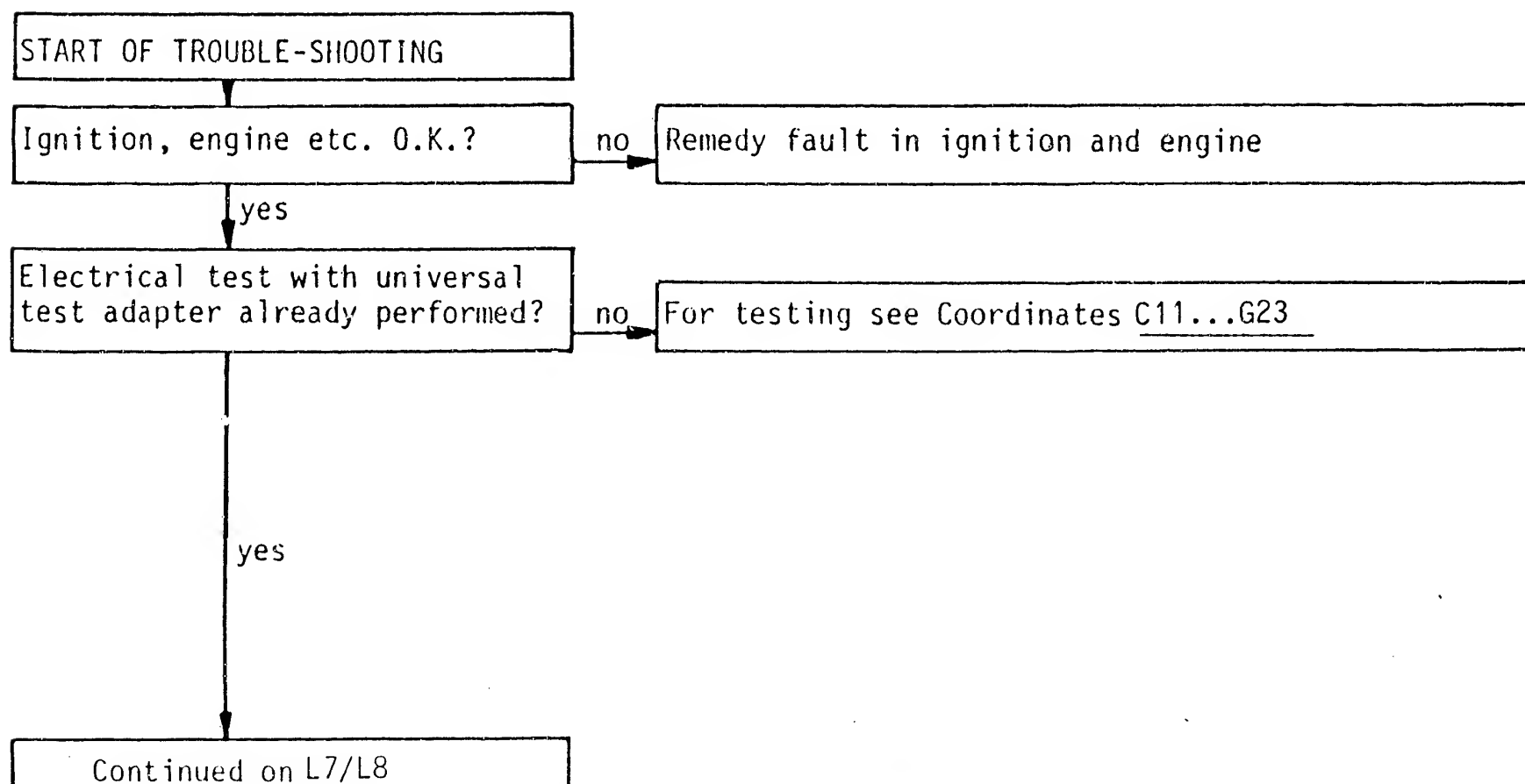
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If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



L5

CO adjustment
Porsche 911 Carrera



L6

CO adjustment
Porsche 911 Carrera



CO adjustment at idle too low or too high (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check the ignition coil and the high voltage distributor: Check the distributor cap on the inside and out for dirt and burnt channels. Check that the rotor guides (flyweights) move freely.

Instructions:

Turn the engine with cylinder 1 to TDC. Adjust the distributor in such a way that the center of the rotor points to the notch on the distributor housing. Adjust the distributor with the long slot by twisting the housing. Engines where a distributor with a long slot has been installed must be given a replacement distributor with a long slot (The new model has only a hole).

When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx. 0Ω). Secondary resistance: 5 to 7.2 k Ω . Check interference-suppression resistors, H.T. ignition cables and spark plugs. Interference-suppression in:

Ignition distributor rotor:	1 k Ω
Ignition distributor - outer dome:	1 k Ω
Ignition distributor - center dome:	1 k Ω
Spark plug suppressors:	3 k Ω

yes

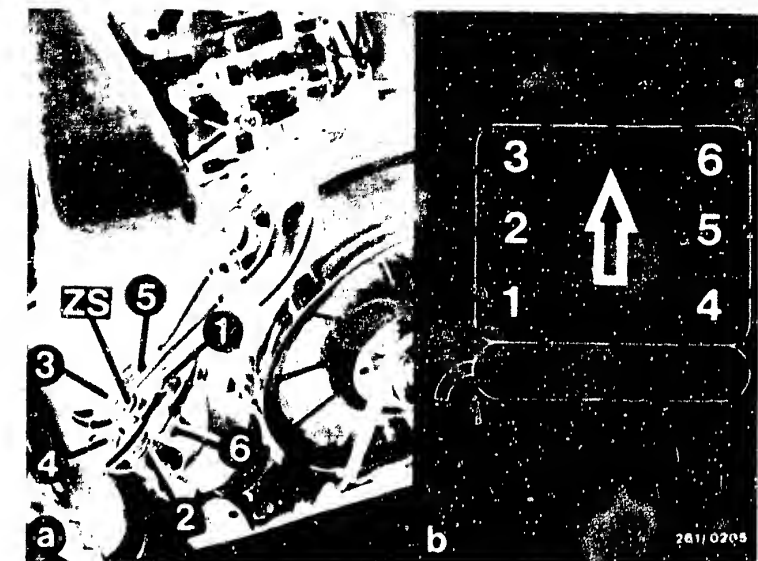
Air-flow sensor O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

yes

Continued on L9/L10

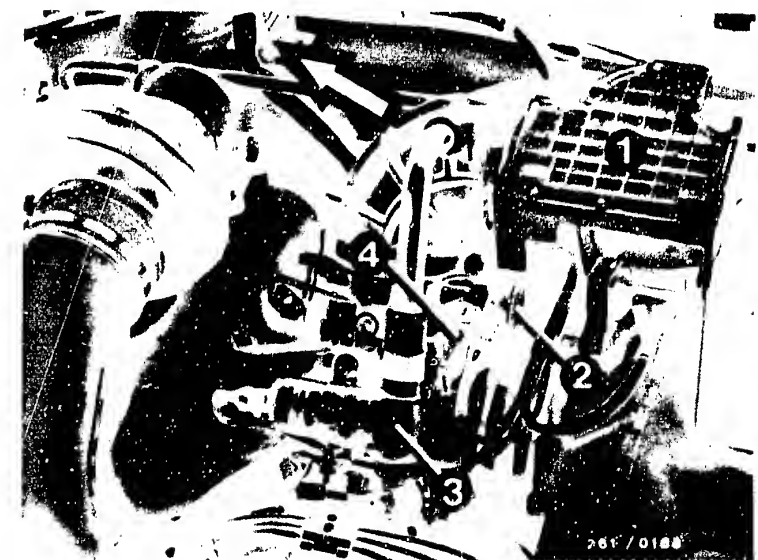


a = High voltage distributor (turn to right)

1 to 6 = cylinder numbers
ZS = High voltage lead to ignition coil

b = Arrangement of cylinders (looking in direction of forward vehicle travel)

Arrow = Center of distributor rotor on housing marking



L7

CO adjustment
Porsche 911 Carrera



L8

CO adjustment
Porsche 911 Carrera



CO adjustment at idle too low or too high (continued)

yes

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks: Seal off the tail pipe and the air inlet point on the air filter.
Unscrew the hose connecting the air-flow sensor to the idle actuator at the air-flow sensor. Seal the hose opening to the idle actuator and, using a compressed air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection

yes

Continued on L11/L12



- 1 = Airflow sensor
- 2 = Throttle valve switch
- 3 = Idle actuator
- 4 = Connection from microswitch

L9

CO adjustment

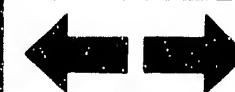
Porsche 911 Carrera



L10

CO adjustment

Porsche 911 Carrera



CO-adjustment at idle too low or too high (continued)

yes

Exhaust gas test with CO-Tester with engine at normal operating temperature. Load devices switched off, ambient temperature 15°C to 35°C.

Test specification:

1.0 ... 1.5 vol. % CO

S/CH/AUS:

0.5 ... 1.0 vol. % CO

USA/Japan:

0.6 ... 1.0 vol. % CO

measured before the catalytic converter, lambda sensor plug connection disconnected.

Make the adjustments as quickly as possible so that the intake paths do not overheat, thus distorting the CO-reading. The ambient air taken in must be between 15°C and 35°C in order to guarantee a correct adjustment.

no

Remove the plastic plugs in the air-flow sensor. For USA/Japan vehicles, use special tools.

• CO setting too low:

Adjust the bypass screw in the air-flow sensor step-by-step in a clockwise direction (turning to right).

• CO setting too high:

Adjust the bypass screw in the air-flow sensor step-by-step counterclockwise (turning to left).

After conclusion of the adjustments, put in a new plug.

1 = Air-flow sensor

2 = Idle-mixture-adjusting screw

1 = Plug connection from lambda sensor

2 = Plug connection from lambda sensor heater

yes

Checking of the customer complaint

"CO setting at idle too low or too high"

has been completed.

Has the customer's complaint been corrected?

no

Additional possible defects:

• Customer complaint has been incorrectly identified (see Coordinates B3 ... B10). If the defect was not identified using the "targeted trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).

• The engine is not mechanically O.K. (compression, valve setting, valve control times, wear on camshafts).

L11

CO-adjustment

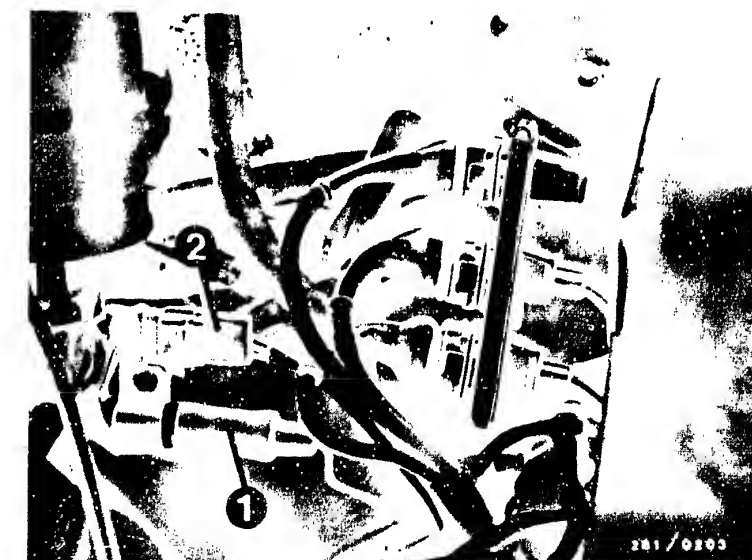
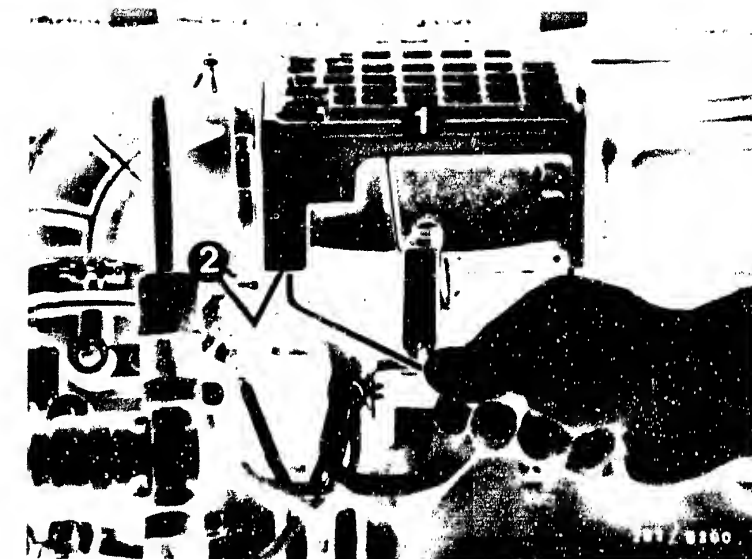
Porsche 911 Carrera



L12

CO-adjustment

Porsche 911 Carrera



After-sales Service

Technical Bulletin

13...39

VDI-1-261/102 En

6.1983

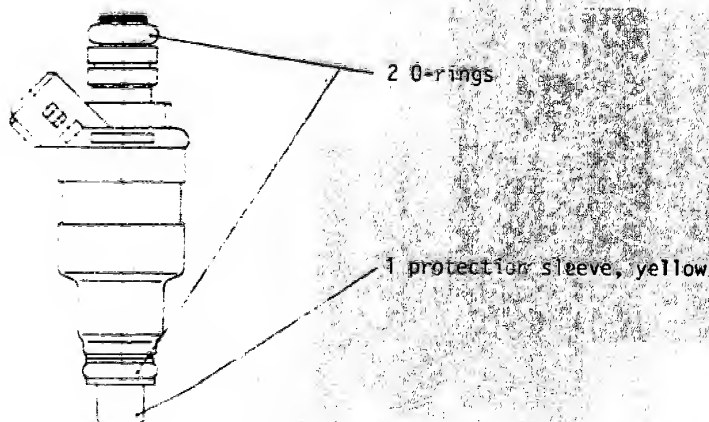
PARTS SET FOR SOLENOID-OPERATED INJECTION VALVES
1 287 010 211

Supersedes 8.1982 edition

10. PRESSURE REGULATORS 0 280 160 2..

The new parts set is available for the Motronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for pressure regulator:
1 O-ring
1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 010... 10...).

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

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N1

Technical Bulletin

Porsche 911 Carrera



Table of contents

When direct trouble-shooting a specific Motronic component it is absolutely essential to look up the respective component under the corresponding customer complaint.

<u>Section</u>	<u>Coordinates</u>
Microfiche layout.....	A 1
1. Rapid check list.....	A 2 - A 16
2. Test specifications.....	A 17 - A 18
3. Electrical terminal diagram.....	A 19 - A 20
4. Installation position of components...	A 21 - A 23
5. Diagram of fuel lines.....	A 24
6. Test equipment and tools.....	B 1 - B 2
7. General information.....	B 3 - B 5
8. Trouble-shooting.....	C 1 - C 10
8.1 Detailed trouble-shooting.....	C 3 - C 4
8.2 Direct trouble-shooting.....	C 5 - C 10
9. Test with Motronic test adapter.....	C 11 - G 23



Troubleshooting program according to customer complaint

<u>Section</u>	<u>Coordinates</u>
<u>STARTING MOTOR TURNS, ENGINE DOES NOT START OR STARTS ONLY WITH DIFFICULTY</u>	
Secondary pictures	H 1 - H 12
Electric fuel-injection valves	H 3 - H 4
Idle actuator	H 3 - H 6
Air-flow sensor	H 7 - H 8
Hose lines, electric lead connections, and test for leaks	H 9 - H 10
<u>ENGINE STARTS AND THEN DIES AGAIN</u>	
Hose lines, electric lead connections, and test for leaks	H 13 - H 20
Idle actuator	H 15 - H 16
Air-flow sensor	H 17 - H 18
<u>UNEVEN ENGINE IDLE</u>	
Secondary pictures	J 1 - J 16
Air-flow sensor	J 3 - J 4
Hose lines, electric lead connections, and test for leaks	J 3 - J 4
Idle actuator	J 5 - J 6
Electric fuel-injection valves	J 7 - J 8
Idle speed and CO-adjustment	J 9 - J 10
	J 11 - J 16



SectionCoordinates

<u>POOR THROTTLE PICK-UP</u>	J 17 - J 24
Secondary pictures	J 19 - J 20
Air-flow sensor	J 21 - J 22
Hose lines, electric lead connections, and test for leaks	J 21 - J 22
Idle actuator	J 23 - J 24

<u>ENGINE MISSING IN ALL DRIVING CONDITIONS</u> .	K 1 - K 10
Secondary pictures	K 3 - K 4
Plug connections	K 3 - K 4
Fuel delivery	K 5 - K 6
Control unit	K 5 - K 6
Air-flow sensor	K 7 - K 8
Alternator	K 9 - K 10
Interference suppressors	K 9 - K 10
Spark-plug connectors	K 9 - K 10

<u>TOO HIGH FUEL CONSUMPTION</u>	K 11 - K 16
Secondary pictures	K 13 - K 14
Air-flow sensor	K 15 - K 16

<u>NO MAX. ENGINE POWER, MAXIMUM SPEED IS NOT ATTAINED</u>	K 17 - L 4
Secondary pictures	K 19 - K 20
Throttle valve adjustment	K 19 - K 20
Fuel pressure at full load	K 21 - K 22
Air-flow sensor	K 23 - K 24
Air intake path	K 23 - K 24
Fuel delivery	L 1 - L 2
Hose lines, electric lead connections, and test for leaks	L 3 - L 4



CO ADJUSTMENT AT IDLE TOO LOW OR

<u>TOO HIGH</u>	L 5 - L 12
Secondary pictures	L 7 - L 8
Air-flow sensor	L 7 - L 8
Hose lines, electrical lead connections, and test for leaks	L 9 - L 10
Exhaust gas adjustment	L 11 - L 12

Technical Bulletins and Service

Information Sheets	N 1
--------------------------	-----

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